3rd Annual **CARBIDES** Feature Issue

The Magazine of C.7.B

FEBRUARY, 1952

TOOLING and PRODUCTION

TOOL & DIE JOURNAL

Putnam *adds* more so you can remove more — easier. Extra operations are added to normal practice in grinding end teeth, so you can be certain of non-clogging, free cutting. The special relief thus produced by Putnam eliminates chip-trapping pockets, tends to force chips out.

For the best in end mill performance, specify Putnam — made by end mill specialists.

PUTNAM
TOOL COMPANY
2985 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN

HIGH SPEED STEEL TOOL BITS

Ready Made

These bits give you convenience, economy, dependability

AVAILABLE in a COMPLETE RANGE of TUNGSTEN and "MOLY" Types:

SUPER PANTHER, PANTHER SPECIAL, ML, LXX, SUPER DBL and DBL-2

Pocket Price List NOW READY!

Just send a postal-card request—giving name, position, company, and address. Ask for "A-L Tool Bit Price List," pocket edition. While you're writing, also include the illustrated four-page folder, "A-L Mill Treated High Speed Steel Tool Holder Bits." Yours for the asking.

Write Today

ADDRESS DEPT. TD-26

These better tool bits, packed in the famous blue-and-gold boxes, are immediately available in standard sizes from stocks located at 28 convenient points throughout the country.

Ready Made—this means that bits are: (1) already cut to correct lengths, with clearance bevel at both ends; (2) already heat treated uniformly by mill experts; (3) furnished with either regular finish or ground finish; (4) inspected individually for hardness, size, and surface. "Finish-ground" bits are extremely accurate in dimension, entirely free from decarburization and scale, and ready for instant use upon grinding the cutting point to desired shape.

With six popular grades to choose from, you can cover a wide range of cutting needs by specifying these tool bits. Our informational service will be helpful to you in selecting grades. Call A-L, or an A-L distributor.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Building, Pittsburgh 22, Pennsylvania.*

For complete MODERN Tooling, call

Allegheny Ludlum

AL FINE TOOL STEELS SINCE 1854

SAY "GOODBYE"

TO BIG PROBLEMS WITH SMALL PARTS

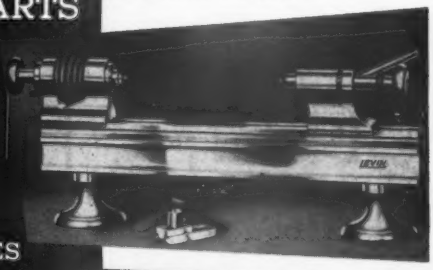
INVESTIGATE

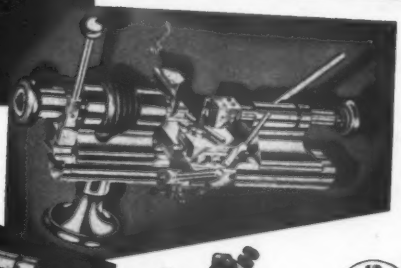
LEVIN®

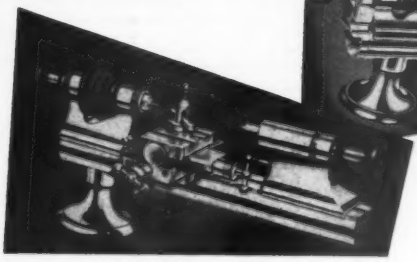
PRECISION JEWELER'S LATHES, ACCESSORIES AND MICRO-DRILL PRESSES

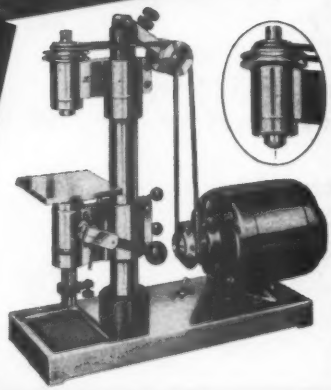
SEND FOR COMPLETE CATALOG

Ideal for second operations or experimental work on small instrument parts where sensitivity is required. Releases expensive, larger lathes for more suitable work. Full line of accessories available.









An extremely sensitive drill press for very small drills down to .002". Drills held in accurate collets to minimize deviation. Spindle run-out less than .0001". Finger tip control enables operator to feel progress of drill.

LOUIS LEVIN & SON, INC.
782 E. Pico Blvd., Los Angeles 21

Lathes
Drill Presses

The Magazine of

TOOLING and PRODUCTION

TOOL & DIE JOURNAL

1975 Lee Road • CLEVELAND 18, OHIO
FAirmount 1-4010

CONTENTS

Vol. XVII, No. 11 February, 1952

Editorial INDEX	58
Editorial	61
Shop Aids	128
Inform-A-Gram	151
Advertisers Index	153
Publication Previews	158
Quick Pic	182
Military and Industrial Production News	188
Progress-on-Parade	206
Contract Tooling and Production	230

Member of CCA

TOOLING and PRODUCTION is published monthly for plant operating and purchasing executives and department heads in 50 types of end product and contract manufacturing companies.

Every copy is directed to such an individual by name, by title, and by company gratis. See CCA certification.

These men, from whom emanate recommendations, requisitions and orders for needed materials, tools, equipment and accesseries, comprise the Cycles of Buying Influence within their respective plants—CBI—and it is they who constitute TOOLING and PRODUCTION'S ever-vital reader circulation.

U. S. rate of subscription for schools, libraries, and individuals other than above, $6.50 per year. Foreign subscription $10.00 per year. Single copy $.75.

EDITORIAL STAFF

E. WILLARD PENNINGTON.....Editor
C. F. BENNER.....Assistant Editor
M. S. REESE.....Departments Editor
A. W. EHLERS.....Contributing Editor

BUSINESS STAFF

G. J. HUEBNER.....Publisher
R. L. HUEBNER.....Sales Manager
B. C. SKELLY....Sales Development Manager
BYRON C. JACKSON.....Research Manager
R. R. SCOTT.....Production Manager
E. C. JOHNSON.....Circulation Manager
E. L. BAUMEISTER...Accounting Department

HUEBNER PUBLICATIONS, INC.

GEORGE J. HUEBNER.....President
RAY L. HUEBNER.....Secretary
RUTH R. HUEBNER.....Treasurer

Publishers of

Tooling and Production • Die Designing and Estimating • Plastics Molds • Thompson Materials Weight Tables • The Know-How-Library of Tooling and Production.

Copyright 1952
by Huebner Publications, Inc.

Acceptance under section 34.64, P.L. and R., authorized

REGIONAL REPRESENTATIVES

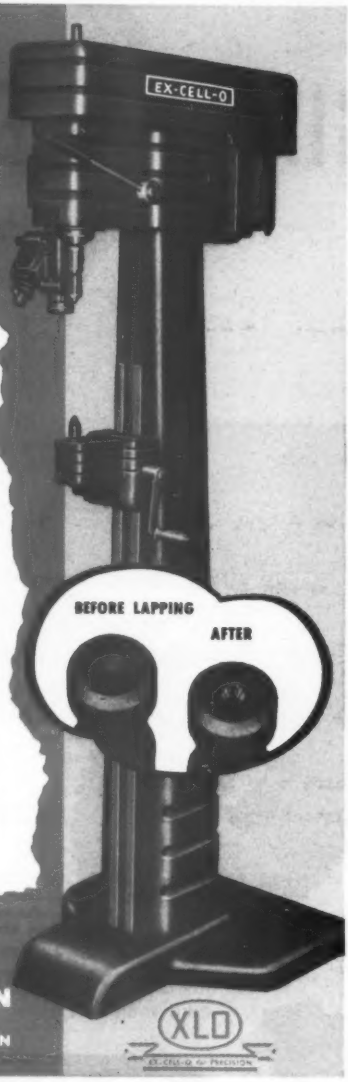
ALTADENA, CALIF., M. D. Pugh, 2721 N. Marengo Ave., SYcamore 7-2894
CHICAGO 1, William O. Dannhausen, 333 N. Michigan Ave., FRanklin 2-4811
CLEVELAND 18, R. L. Huebner, Jerry J. Miller, 1975 Lee Road, FAirmount 1-4040
DETROIT 2, R. F. Pickrell, 314 Stephenson Bldg., TRinity 2-0790
NEW YORK 17, H. Thayer Heaton, 415 Lexington Ave., MUrray Hill 2-1647
PHILADELPHIA 43, PA., James R. Corgee, 5925 Chester Ave., SAratoga 9-4121

For Precision
Between Centers

EX-CELL-O

CENTER LAPPING
MACHINES

Meeting today's precision standards requires careful checking of every phase of the job, *including the center holes in the work.* Ex-Cell-O Center Lapping Machines correct inaccuracies of center holes that affect the quality of all subsequent operations performed between centers. These machines are precision built and are easy to operate. They are fully described in Bulletin 40271—a copy is yours for the asking.



EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

GIANT GEAR RIMS

Wedge action die for bending rings in horizontal position. Removable inserts adapt this die for various diameters.
Just another job for versatile CINCINNATI PRESS BRAKES

This 35½" diameter, 4" face steel gear is economically produced by bending and welding.

This steel gear rim is completely formed from flat bar to ring in less than two minutes by repeated hits on a Cincinnati Press Brake.

The wedge action dies require but little tonnage to bend this 2" x 4" hot rolled 35-45 carbon steel bar.

The great versatility of the Cincinnati Press Brake eliminates the need for an additional and highly specialized machine on this small-run job.

Low cost and quick changeover from job to job are among the factors that will make Cincinnati Press Brakes profitable in your shop.

Write for Press Brake Catalog B-3.

Contact our Engineering Department, who will suggest and advise on your production problems.

Press Brake

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

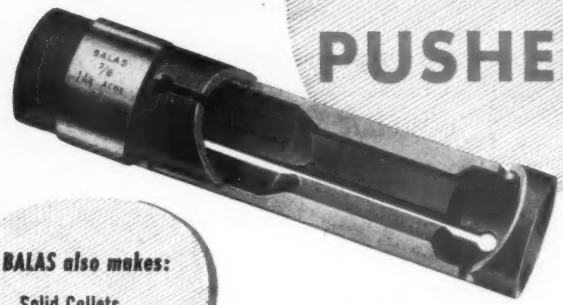
CINCINNATI

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

over 3,000,000 parts

produced on one machine with

BALAS PUSHERS



BALAS also makes:

- Solid Collets
- Special Collets
- Master Collets
- Squirrel Cage Pushers
- Master Pushers
- Feed Fingers

This particular "run" was reported by a leading automotive and aircraft part manufacturer. Over 3,000,000 parts were produced using Balas Pushers in a Davenport machine...and no pusher failure was encountered. It is not an unusual record for BALAS!

You, too, can obtain outstanding production records with Balas Pushers. They are precision machined from solid bar stock of selected quality. In addition, rigidly controlled heat-treating assures proper spring tension and a hard bearing area.

Use Balas Pushers and be sure of more production and less stock waste. Whether your problem is simple "feeds" or difficult jobs such as long feed-outs, high speeds and scratchless operation, Balas Pushers are essential in turning out good work...and turning it out fast. For peak production—Best Buy Balas!

BALAS COLLET MANUFACTURING CO.

1555 EAST 27th STREET CLEVELAND 14, OHIO

WORLD'S LARGEST MANUFACTURER OF COLLETS EXCLUSIVELY

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

PORTER PRECISION PRODUCTS

IMMEDIATE DELIVERY
on all
STANDARDS
●
SPECIALS TO ORDER

Durable 3-P Punches consistently give you dependable . . . cost-saving performance.

"Still The Best Performer"

SAVE TIME—SAVE MONEY WITH FAMOUS 3-P PUNCHES

PORTER PRECISION PRODUCTS

JAckson 9669 Cincinnati 31, Ohio

FOR PROMPT SERVICE CALL

*MILWAUKEE, WISC.	Division 4-3028	*TULSA, OKLA.	3-6212
*WICHITA, KANSAS	4-2379	CHICAGO, ILL.	FRanklin 7100
*LOS ANGELES, CAL.	TRinity 1539	NASHVILLE, TENN.	2-7208
*DETROIT, MICH.	TRinity 1-3080	DALLAS, TEXAS	FR 1521
*CINCINNATI, OHIO	KIrby 5432	KANSAS CITY, MO.	DELmar 9600
*INDIANAPOLIS, IND.	RIley 4319	ATLANTA, GEORGIA	DE 4477

*Indicates complete stock

Send For Catalog —Today!

SEE US AT A.S.T.E. SHOW IN CHICAGO
BOOTH 1830 ● MARCH 17-21, 1952

Punchess Die

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Die Steel Users—NOTE:

re's what "DESEGATIZED" does for you

- Assures dies with absolute structural uniformity throughout
- Eliminates machining difficulties that result from brittle carbide clusters.
- Guarantees dies that respond uniformly to proper heat treatment
- Overcomes the risk of premature wear due to irregular carbide dispersion
- Insures consistent—and longer—production runs

Production economy demands the best die performance! Back your program up with the very finest die steels—the "DESEGATIZED" Hi Carbon-Hi Chromium die steels!

ATROBE ELECTRIC
STEEL COMPANY
LATROBE, PENNSYLVANIA
WAREHOUSE STOCKS MAINTAINED
IN PRINCIPAL CITIES

SEND FOR THIS BOOKLET TODAY

LATROBE ELECTRIC STEEL CO.
Latrobe, Pa.

Please send "WHY DESEGATIZED" booklet to:

NAME .....

POSITION .....

COMPANY .....

STREET .....

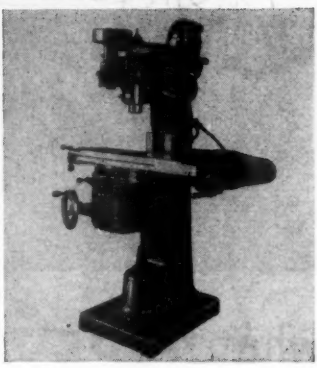
CITY ..... ZONE ..... STATE .....

TP

Remember "INDEX"

The Outstanding Name in
MILLING MACHINES

For High Production and Precision, Low Original and Maintenance Cost



MODEL 40, VERTICAL MILL has proved for 14 years that precision need not be expensive. Thousands in use, giving highly satisfactory performance. While it is not a jig borer, it is widely used for accurate boring and locating. The improved spindle drive gives nine spindle speeds, an ample range for all operations. CAPACITY, ⅛" to 1" end mills in tool steel. TABLE, working surface 8" x 26", 8" x 34" overall.

See Us at the A.S.T.E. Show, March, Chicago

◀ **MODEL 55** IMPROVED VERTICAL MILL. A speed range of 80 to 2700 RPM's, 1 H.P. drive, 3⅛" quill, extra rugged spindle, capacity of ⅛" to 1½" end mills in steel. Spindle quill travel is 5¼". Table 40" x 9" or larger.

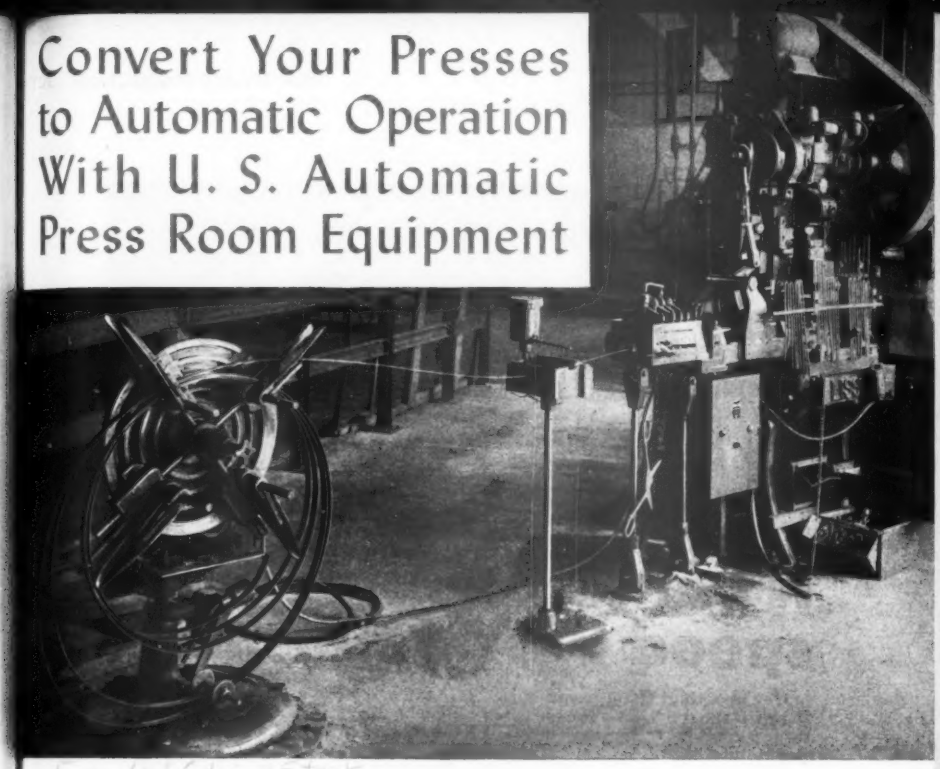
MODEL 60 PLAIN HORIZONTAL MILL. A full No. 1 that equals or exceeds a light No. 2 in capacity. Designed for the average tool room, but its rigidity and low maintenance cost make it suitable for requirements of production shops. Standard Table 40" x 9" with larger table optional.

Write for Literature

INDEX MACHINE CO.

541 N. MECHANIC STREET JACKSON, MICHIGAN

Convert Your Presses to Automatic Operation With U. S. Automatic Press Room Equipment



Obtain the advantages of automatic operations in your Press Room by using U. S. Slid Feeds, Straighteners, Stock Reels, Coil Cradles, Scrap Choppers, etc. These units are designed and built to provide increased efficiency, greater production and material savings, and reduced labor costs.

The photograph above — courtesy of Whirlpool Corporation, St. Joseph, Mich., prominent manufacturers of Home Laundry Equipment for over 50 years — illustrates a set-up of U. S. Automatic Press Room Equipment at their plant.

The U. S. Slide Feeds are recognized as the most accurate automatic Feeds on the market. They can pull material, within their capacity, through a Plain Stock Straightener and still maintain controlled accuracy. Bulletin No. 80-T contains complete specifications. Ask for your copy.

US PRODUCTS

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Mills

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

New! Two tough chips speed barrel finishing

Get smoother, faster barrel finishing with the toughest abrasive chips on the market—"Honite" and "Super Honite!"

"Honite" retains a cutting edge longer than any other *natural* barrel finishing abrasive. It's ideal for fine finishing to close tolerances, and for many other jobs involving a minimum amount of metal removal.

"Super Honite" is a heavy, *synthetic* stone that gives more than twice the life of other abrasives—the only stone engineered for both grinding and finishing.

And, like other stones, "Honite" and "Super Honite" work best in combination with "Honite" Compounds—the "secret of success" for dependable, consistent finishing results.

Stop expensive "guessing" for the *right* materials and methods! Experienced 3M Engineers are ready to work with you to help you get best barrel finishing results at the lowest possible cost. Use coupon below for complete information and a copy of "3M Barrel Finishing." No obligation.

Minnesota Mining & Mfg. Co.
Dept. PF-9, St. Paul 6, Minn.

Name.....
Firm.....
Address.....
City.....Zone...State.....

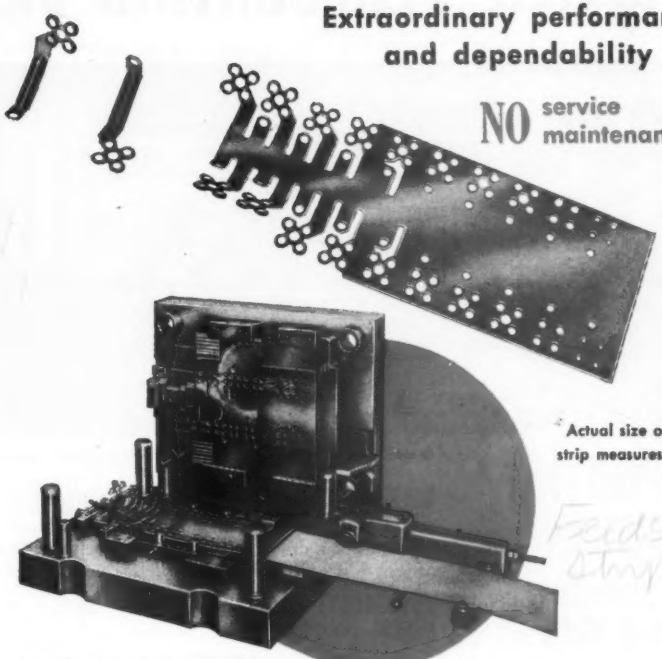
Honite BRAND

BARREL FINISHING CHIPS • COMPOUNDS • EQUIPMENT

Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Adhesives. General Export: Minn. Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N. Y. In Canada: Minnesota Mining & Mfg. of Canada, Ltd., London, Canada.

Extraordinary performance and dependability

NO service maintenance



Actual size of work strip measures 21¼".

ELEVEN station progressive die for production of right and left hand ignition cable supports. Photograph illustrates Rol-Di-Feed mounted directly on die set, feeding .073" thick x 7⅞" wide c.r.s. In operation over two years —customer reports no service or maintenance expense!

WRITE TODAY FOR COMPLETE DETAILS

ANOTHER fine example of the outstanding performance characteristics you can expect from Dickerman 9 inch Rol-Di-Feed.

DICKERMAN 9 INCH ROL-DI-FEED

MAJOR manufacturers of appliances, time pieces, sun glasses and cameras, motor laminations, lighting fixtures, locks and prominent stamping companies now use the Rol-Di-Feed.

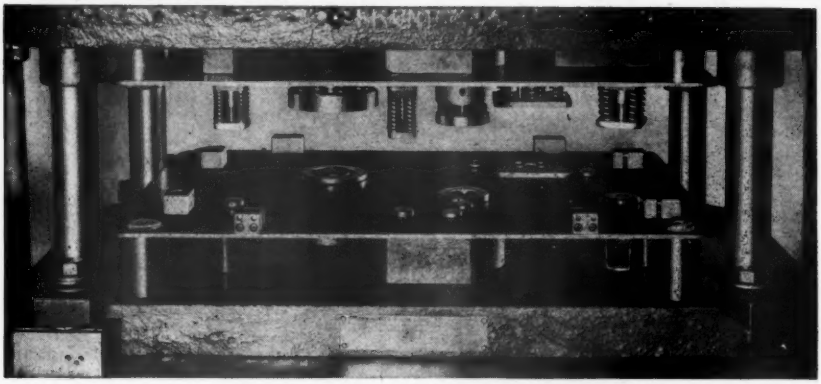
Investigate the advantages of automatic feeding with Dickerman Rol-Di-Feed.

H. E. DICKERMAN MFG. CO.

DEPT. B, 323 ALBANY STREET SPRINGFIELD, MASS.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Magnetic PERFORATING DIES



● Magnetic Perforating Die set-up in small inclinable punch press.

NEW and FAST METHOD for perforating Sheet Metal

● Die retainers complete with bushings being inserted in die template.

SAVE PRESS DOWN TIME. Approximately 15 minutes required to change from punching one subject of say 20 holes to a different 20 hole arrangement. Whistler Magnetic Perforating Dies *increase* press production.

HOLD CLOSE TOLERANCES. Hole centers may be held to .0005" accuracy or as close as can be jig bored.

GREATER PUNCH AND DIE LIFE. Concentricity of punch and die assured thus giving uniform clearance around punch, increasing punch and die life.

SAVE FLOOR SPACE. Die storage cut to a minimum because only the 2 locating templets are stored...all that is required to duplicate the set-up.

REDUCE DIE COSTS. Whistler Magnetic Perforating Punch and Die units are used repeatedly for different hole arrangements. When completing one job, remove all units from templet and put them into service on the next different set-up. Combine any number of hole sizes and shapes. Punch and die costs are amortized over continued re-use in many jobs.

Write for Catalog Whistler Magnetic Perforating Punches and Dies have *proven* their cost-cutting advantages in many prominent plants. The catalog shows how. Send for it today.

S. B. WHISTLER & SONS, Inc.

748 Military Road, Buffalo 17, N. Y.

Also manufacturers of a complete line of drawing, forming, blanking and progressive dies to special requirements.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

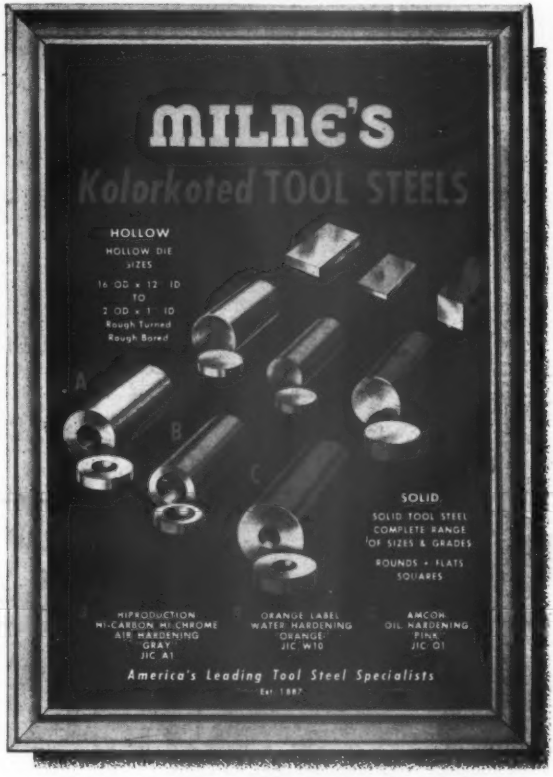
HOW MILNE CAN BRIGHTEN YOUR TOOL STEEL PICTURE

...with these three cost-reducers

1 Entire length Kolorkoted for permanent, quick-as-a-glance identification . . . eliminates confusion.

2 Heat treat card of color to match Kolorkote on steel goes with every shipment . . . eliminates errors.

3 Hollow Die Steels with smooth finish inside and out, no scale, no decarb . . . minimize machining, reduce waste. Saw cut to length.



Visit Us At Booth 120 During The ASTE Show—Chicago, March 17th through March 21st.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Showing a setup of Wales Type "BL" Hole Punching and Type "N" Notching Units for punching and notching in the same operation on a Wales Twin Column Press.

Showing a template setup of Wales Type "H" Hole Punching Units for punching holes in curved and straight flanges and rims on a Wales Twin Column Press.

Showing a Wales Twin Column Press with the Wales Multiple Hole Punching System operating on a press bed.

an unbeatable combination

WALES HOLE PUNCHING AND NOTCHING UNITS *and* WALES TWIN COLUMN PRESSES

● A typical example of the unique design built into Wales Twin Column Presses is the double crank pull down drive on the pair of ram guides. This feature provides equal pressure on both ends of ram and assures parallel alignment of ram to press bed.

Also this alignment feature works hand-in-hand with the exclusive, independent, self-contained Wales Hole Punching and Notching Units with built-in punches and dies which are held in perfect alignment by holders. In addition, Wales Units do *not* require die sets as nothing is attached to press ram.

Have the complete story *of this unbeatable combination* at your fingertips by writing for fully-illustrated, functionally-colored catalogs TODAY.

WALES-STRIPPIT CORPORATION
GEORGE F. WALES, *Chairman*
355 PAYNE AVE., NORTH TONAWANDA, N. Y.
(Between Buffalo and Niagara Falls)
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO
Specialists in Punching and Notching Equipment

Presses Punch

ALLEN ⬡ SCREW . . . SOCKET SCREW

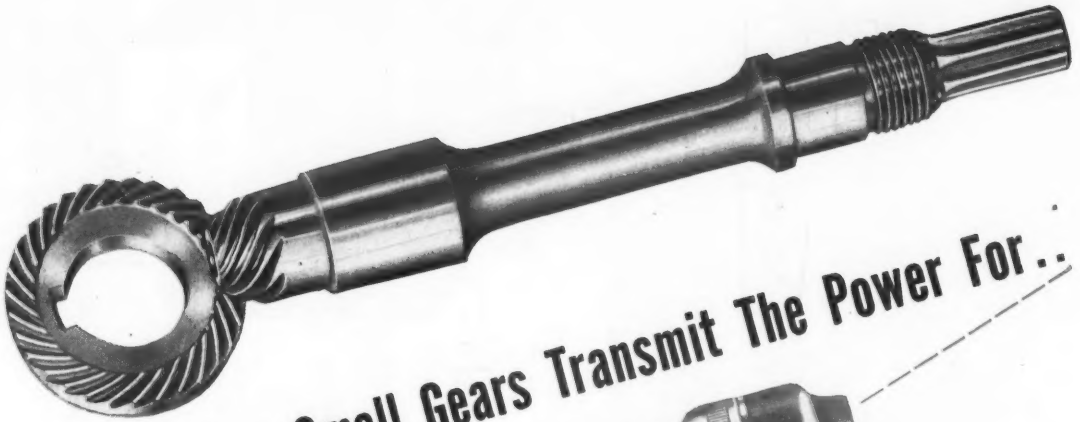
mean the same thing everywhere!

Although *Allen ⬡ Screw* is not in the dictionary, engineers and production men the world over say *Allen ⬡ Screws* to refer to *precision socket screws.* That's how it is with names — probably there's a name that comes to your mind at once as an outstanding *Industrial Distributor* in your locality. He is almost certain to be the one who handles *Allen ⬡ Screw* products. His experience and extensive stock of Allen ⬡ products are the ideal combination to smooth out any problems you encounter in precision fastenings.

THE **BUY** WORD IN SOCKET SCREWS IS **ALLEN**

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION



G.S. Precision Small Gears Transmit The Power For..

ARO RIGHT-ANGLE SCREW DRIVERS

The Aro Equipment Corporation of Bryan, Ohio, is another of the *many* precision-minded manufacturers who look to G.S. for *better* Fractional Horsepower Gearing. ARO's rigid requirements for every component used are largely responsible for the reliability and long life of their popular line of tools. G.S. is happy to contribute to the success of a manufacturer with so excellent a reputation for extreme mechanical precision.

You, too, can have confidence in G.S. matchless skill and facilities. Here are men and methods and machines developed to the highest known degree of

component used are largely responsible for the reliability and long life of their popular line of tools. G.S. is happy to contribute to the success of a manufacturer with so excellent a reputation for extreme mechanical precision.

You, too, can have confidence in G.S. matchless skill and facilities. Here are men and methods and machines developed to the highest known degree of economy and efficiency through 30 years of *specializing* in making *better* Small Gears. Consider this an invitation to *make us responsible* for YOUR Small Gearing needs. Call us in at the drawing board stage. You'll like the friendly, helpful cooperation of our capable staff. Tell us your problems, your needs. Try G.S. service TODAY!

SEND FOR FREE NEW

6-page folder illustrating and describing G.S. facilities, Small Gearing and applications, together with handy charts. Will you ask for it on company stationery, please?

FRACTIONAL HORSEPOWER GEARING

GEAR Specialties, Inc.

Spurs · Spirals · Helicals · Bevels · Internals · Worm Gearing · Racks · Thread Grinding

2635 WEST MEDILL AVENUE · CHICAGO 47, ILLINOIS

MEMBER OF AGMA

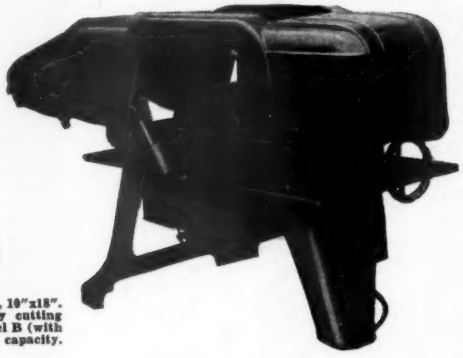
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

RIGHT NOW A JOHNSON METAL CUT-OFF BAND SAW

IS A *Better Investment* THAN EVER!

Make Full Use of Present Steel Stocks



Model J Pictured. Capacity, 10"x18". Available as a wet or dry cutting machine. Also Junior Model B (with or without casters) 5"x10" capacity.

Yes, present-day steel shortages present problems. Maybe you are having your troubles getting the sizes you require. . . . That's where a Johnson Band Saw can fit into your picture to added advantage. You probably have material in your stock rack now that you could cut to the sizes you need by using a Johnson Saw, which otherwise would not be available. So we urge that you write us, get the catalog and full details about Johnson Band Saws, the leaders in their field. . . . The machines that last indefinitely and deliver the most in time-saving, accuracy and efficiency.

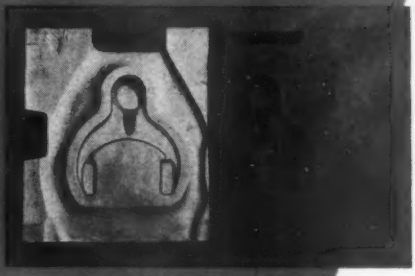
There is a Dealer Near You

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

The Solution To Your Die and Mold Cleaning Problems

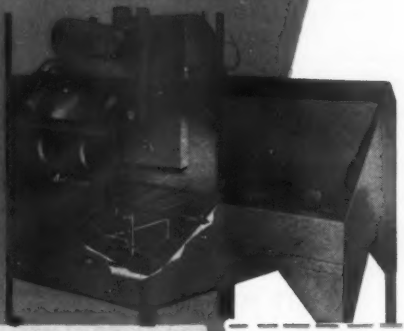
-LIQUAMATTE WET BLASTING



Typical heat treated forging die, one half of which has been cleaned with the Liquamatte using a fine mesh Liquablast sive.

Fourteen exclusive, advanced design features incorporated in the Liquamatte method of close tolerance finishing assure better, less costly cleaning in the manufacture and maintenance of tools, dies and molds. Its simplified design overcomes the many operating difficulties often found in wet blasting.

With the Liquamatte, "hand" finishes are produced mechanically in a matter of seconds, eliminating many tedious operations. Precision parts can be processed while holding tolerances of .0001". Scale and directional grinding lines are uniformly removed greatly prolonging the life of expensive tools and dies. "Break-in" time of new dies is reduced to a minimum.



Cutaway view of the Liquamatte, equipped with traveling work car permitting cleaning of heavy molds and dies.

GET THE FACTS
Clip coupon for Bulletin 23

Contains
Advantages
Specifications
Applications

American LIQUAMATTE WET BLASTING
WHEELABRATOR & EQUIPMENT CORP.
852 S. Byrkit St., Mishawaka, Ind.

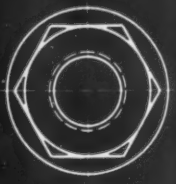
Please send me Bulletin 23.

Name_____ Title_____
Firm_____
Address_____
City_____ Zone_____ State_____

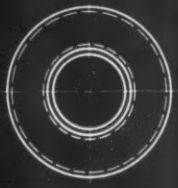
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

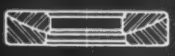
Metal Cleaning

KNOB SHOE ASSEMBLY



FLANGE NUTS





SPHERICAL WASHERS

STANDARDIZE

WESPO

STANDARD FIXTURE PARTS and FITTINGS

★ ★ ★

The cut shows a few of the 350 parts and fittings which are used by leading manufacturers to save time and money formerly spent in designing and machining.

WESPO parts are precision manufactured of quality steel—heat treated and rust proofed. They are made for heavy duty and long usage and have proved their value in many industries.

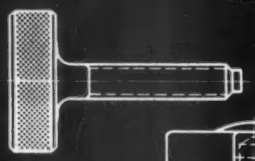
OVER 350 PARTS AVAILABLE

This wide variety of types and sizes makes it easy to use WESPO parts for almost any of your fixture needs. TEMPLATE DRAWINGS OF ALL PARTS ON REQUEST. Write for catalog.

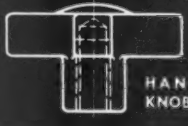
WEST POINT MFG. CO.

26935 West 7 Mile Road

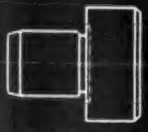
Detroit 19, Michigan



ADJUSTING HEAD SCREWS



HAND KNOBS



REST BUTTONS

T-SLOT NUTS

TEMPLATE DRAWINGS OF ALL PARTS FREE

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Fig 3 Fixture Parts

45,000 score-free parts...after switching to GRAPH-MO steel dies!

THE CLARK GRAVE VAULT COMPANY, Columbus, Ohio, ran into trouble in making sheet steel top panels for home appliances. Parts were coming off the dies badly scored. Expensive hand finishing operations were necessary. And production was very low due to pickup and galling on the dies. Obviously, the ordinary tool steel used in the dies wasn't doing the job.

Engineers at The Clark Grave Vault Company started a search for a tool steel to replace the one they were using. They found the answer in Graph-Mo—one of four Timken® graphitic tool steels. When The Clark Grave Vault Company switched to Graph-Mo dies, pickup, galling and scoring were entirely eliminated. More than 45,000 pieces have been made on these dies and the dies are still turning out score-free panels.

Because of free graphite and diamond-hard carbides in its structure, Graph-Mo has minimum tendency to scuff, score or gall. Graph-Mo offers other advantages for dies, too. It machines to close tolerances quickly and easily, offers unusually stubborn resistance to wear, hardens uniformly with minimum distortion.

For further information, write for the enlarged 10th edition of the Timken Graphitic Steel Data Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

Fine Alloy

STEEL

and Seamless Tubes

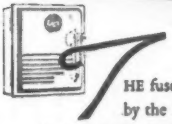
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Various Sizes and Graduations
Shockproof
Dial Indicators
Converts AGD Adjustable Limit Snap Gages to Dial Type Instruments
Patent Applied For
Dializers
Adjustable Limit Snap Gages
Dial Bore Gages
7 Sizes Cover Range ⅜"-12⅛"
Just a few of many
STANDARD Gages
In so many ways they help you do the job better . . . easier!
Dial Comparators
Dial Snap Gages
DuBo Plug Gages
Patented
Light in Weight Sensitive, Definite Check
Master Setting Gages
Write for the New Catalog B
STANDARD Gages
STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

teamed precision of die and

PRODUCTO DIE SET

makes this intricate job possible



THE fuse terminal, shown below, is produced by the Federal Electric Products Co. for use in their Noarc front operated safety switch. A Producto Die Set was selected to maintain the precise production of a top quality die at high speed operation.

Material is half hard 3/32″ copper (Rockwell 30-40 B scale), automatically fed to a Niagara 40 ton press. The progressive die stations are:1) pierce and stamp, 2) notch, 3) lance and emboss, 4) form 5) finish form. Die is held to extremely close tolerances. Production: 4000 pieces (1-3/16″ x 2-1/8″) per hour, 70,000 between grinds.

Today's production calls more than ever for quality control . . . which, in die work, necessitates the best in die sets. Call for Producto . . . and be sure!

the PRODUCTO MACHINE COMPANY
970 HOUSATONIC AVENUE
BRIDGEPORT 1, CONNECTICUT

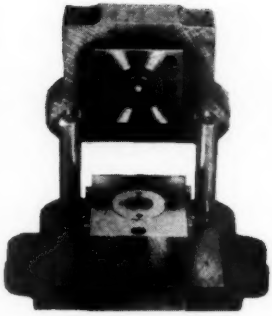
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

"A MUST wherever WASHERS are made!"

HOVIS

OFFERS YOU THIS SIMPLE, UP-TO-THE-MINUTE METHOD

There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.



Made in 5 sizes:
¼"—1½"—2½"—4"—6".

Write for literature.

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD Phone: Slocum 7-1334
VAN DYKE, MICHIGAN Suburb of Detroit

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Versatile Kempsmith Milling Machine Proves Ideal for Long Production Runs

You'll find the new Kempsmith LH Miller gives you a rugged, lightweight machine that combines simple, rigid construction with maximum flexibility. It enables you to attain your production goals on such jobs as small end milling, high speed jig boring, keywaying, oil grooving, light straddle milling, etc. Designed by experienced Kempsmith Engineers . . . men who have met the milling machine requirements of industry for more than 60 years. Write for your copy of Bulletin No. 127 describing this versatile machine.

KEMPSMITH MACHINE CO.
1829 SOUTH 71ST STREET
MILWAUKEE 14, WISCONSIN, U. S. A.

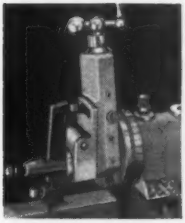
KEMPSMITH LH MILLER

LOW in Initial Cost and Upkeep
HIGH in Accuracy and Rigidity

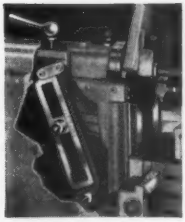
KEMPSMITH
Precision Built Milling Machines Since 1888

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

SOUTH BEND 7" PRECISION SHAPER

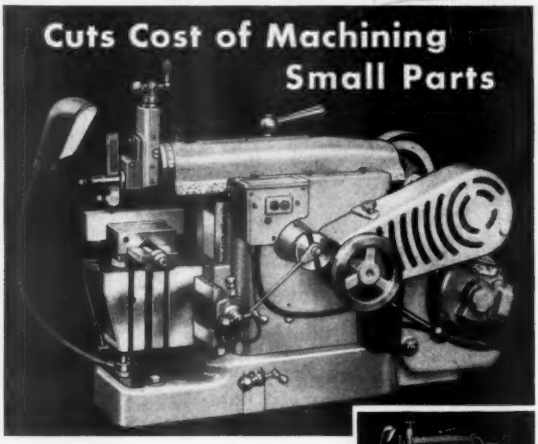


Rugged tool head locks in any position.



Graduated eccentric for stroke adjustment.

Guards on all belts and pulleys.



Saves Time... Saves Labor

It's fast—accurate—easy to operate. This shaper can consistently give you low machining costs on small parts. Its use will release your large shapers for heavier work, save on machine investment, power and maintenance. *Send coupon for literature.*

SPECIFICATIONS

RAM — Stroke length — 0 to 7". Strokes per minute (4)—42 to 195.

TOOL HEAD — Feed—3". Rotation—360°.

TABLE — 9½" horizontal travel, 5" vertical. Power cross-feeds (6)—.002" to .012". Clears ram—½" to 5½".

VISE — Jaw width — 4". Jaw depth — 1". Maximum opening — 4". Swivel base.

SOUTH BEND LATHE
South Bend 22, Indiana
Building Better Tools Since 1906

Steel stand—3 drawers and chip pan.

The South Bend Machine Tool line also includes 9", 10", 13", 14-1/2", 16" and 16-24" Precision Lathes and 14" Drill Presses, all available in several models.

Send Information Checked:

☐ 7" PRECISION SHAPER ☐ LATHE ATTACHMENTS

Name_____

Company_____

Street_____

City_____ State_____

☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES

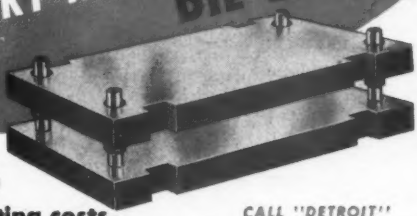
☐ 1/3" and 1" collet TURRET LATHES

☐ 14" DRILL PRESSES

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

"DETROIT" means...

FACTORY-ASSEMBLED
FACTORY-INSPECTED
DIE SETS



**with "DETROIT"
you save mounting costs,
increase production runs**

First: "Detroit" craftsmen, working with finest precision equipment, take pride in the superior quality of every "Detroit" Die Set. ***Second:*** Every set is fully assembled and inspected at the factory. Here are complete inspection facilities and testing skill that mean each "Detroit" Die Set is right before it is shipped.

For prompt delivery, or information, call your "Detroit" representative.

CALL "DETROIT"

DETROIT	TR 2-5150
BIRMINGHAM, ALA.	3-1341
BUFFALO	PA 9206
CHICAGO	PU 5-7694
DAYTON	HE 3042
INDIANAPOLIS	HU 5604
LOS ANGELES	AD 7251
MILWAUKEE	GL 3-7170
MINNEAPOLIS	PR 1822
MONTREAL, CAN.	WI 1186
NASHVILLE	7-0437
NEWARK	MA 2-4318
PHILADELPHIA	VI 4-4084
PITTSBURGH	Perrysville 4-5111
ROCK ISLAND, ILL.	R.I. 8-2814
ST. LOUIS	FR 6811
ST. PAUL	CE 1600
TOLEDO	MA 4510
TORONTO, CAN.	PL 3813
TULSA	3-8193
WICHITA	5-8682
WINDSOR, CAN.	2-1575

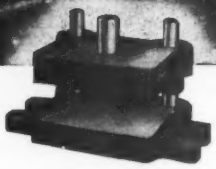
DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.

DETROIT DIE SET ★

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

NOW get famous DIE-CO Quality in all your die sets!

A section of our large stock ready for delivery.



Introducing- the Complete, New DIE-CO Standard Die Set Line

The same higher precision, smoother performance, longer life of DIE-CO Special Die Sets are now featured in these new DIE-CO Standard Die Sets. Longer trouble-free press runs, less down-time. Wide range of types and sizes in stock. Ask for DIECO Catalog No. 6-C.

The DIE SUPPLY Co.

1400 Brookpark Rd. • Cleveland 9 • SHadyside 1-9000
915 Valley Street • Dayton 4 • Michigan 9691
122 S. Sheridan Ave. • E. E. Pittsburgh 6 • EMerson 1-0463

DIE-CO

MICROBORE
by DeVLIEG

Simplify Multiple Boring

BY RAPID SET-UP AND INDIVIDUAL TOOL ADJUSTMENT

- BORING
- TURNING
- FACING

MULTIPLE BORING OF AN AUTOMOTIVE TRANSMISSION CASE

ILLUSTRATED CATALOG MAILED ON REQUEST

FOUR SPINDLES (Left to Right)
1. Bore and Chamfer .995/.956 diameter
2. Bore and Chamfer 4.9995/5.0005 diameter
3. Bore and Chamfer 3.1494/3.1504 diameter
4. Bore .9525/.9535 diameter

DeVLIEG MICROBORE COMPANY

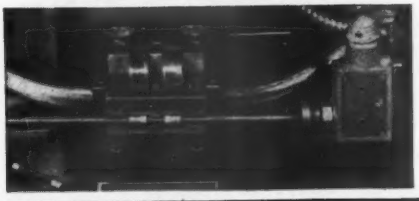
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

DON'T HANDCUFF VALUABLE MANPOWER!

FREE IT FOR MORE IMPORTANT WORK— BY USING

DPS *Motorized* **HOPPER UNITS**

Modern production demands the speed and accuracy of this great aid to SELECTIVE FEEDING. It makes slow, manual methods obsolete and releases "frozen" manpower for more productive work. D.P.S. Motorized Hopper Units select, orient and feed production parts of a wide variety to a given position for primary and secondary operations. They are readily adaptable to all types of standard production equipment and special machines that would otherwise require constant attention by an operator.



At left—Semi-automatic method of inserting flare nuts on tubing prior to the tube flaring operation. The tube nuts are pre-selected and fed in the motorized hopper units, delivering them in a uniform position; and a transfer mechanism is provided to align the nuts so that the operator simply inserts the tubing through the two nuts, and makes contact with a micro switch which ejects the assembly from the machine. This formerly was strictly a manual operation, the operator individually handling each one of the flare nuts and selecting it for placement on the tube.

SEE US AT THE A.S.T.E. SHOW MARCH, CHICAGO

DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICHIGAN

Feeds: Hopper

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

INGERSOLL

135 H.P. IN ONE CUTTER

Milling Tough Alloy Steel Castings

Cuts requiring up to 135 horsepower are taken with this Ingersoll Extra Heavy Duty Carbide Shear Clear Face Mill, using a 100-horsepower Ingersoll Centrally Driven Adjustable Rail Milling Machine.

The pictures show the kind of cuts which are possible in milling cast steel with a properly designed cutter and a machine of adequate power and strength.

Many of our customers are using carbide-tipped Shear Clear cutters to advantage machining the hard, tough steels encountered in manufacturing tanks, guns, aircraft parts and other military equipment.

Whatever your milling requirements may be, we would like an opportunity to check your work and equipment and to recommend Ingersoll Cutters.

THE INGERSOLL MILLING MACHINE CO.
ROCKFORD, ILLINOIS

Carbide Milling Cutters

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Severance Regrinding Service

RECONDITIONING TO NEW-TOOL PERFORMANCE AT A FRACTION OF NEW TOOL COST!

☆ HIGH SPEED and CARBIDE ☆

Why take less?-- for Safety, Efficiency, Economy-- insist on genuine factory reconditioning service performed by *Severance New Tool Craftsmen!*

CONSERVE CARBIDE TOOLING

THIS BEFORE AND AFTER PICTURE SHOWS WHAT OUR NEW-TOOL CRAFTSMEN CAN ACTUALLY DO WITH YOUR BATTERED CARBIDE TOOLS OF THIS AND SIMILAR TYPES

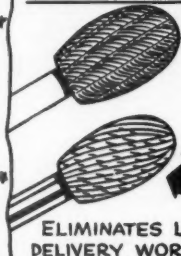
CONSERVE THROUGH REGRINDING

REPRESENTS A NEW SEVERANCE MIDGET MILL (HIGH SPEED OR CARBIDE)

REPRESENTS THE SAME TOOL AFTER 20 REGRINDS

YOUR DULL CUTTERS ARE REGROUND BY SEVERANCE NEW-TOOL CRAFTSMEN

CONSERVE THROUGH SALVAGE



YOUR DULL ROTARY FILES can be ground into MIDGET MILL TYPE TOOLS LIKE THIS

ELIMINATES LONG DELIVERY WORRIES-- Saves Your Dollars!

We're the Originators

OVER 20 YEARS EXPERIENCE IN THIS MONEY SAVING SERVICE

★ *We've been copied but not surpassed* ★

DEPENDABLE DELIVERIES ARE ASSURED ★ THROUGH SEVERANCE REGRINDING SERVICE

We Regrind: MIDGET MILLS, ROTARY FILES, BURS, FILE BANDS, COUNTERBORES, COUNTERSINKS, ETC.

SEND YOUR DULL CUTTERS TO

SEVERANCE TOOL INDUSTRIES INC.

730 IOWA AVE. • SAGINAW, MICH.

CATALOG INCLUDING REGRIND PRICES SENT ON REQUEST

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Contract Services / cutter grinding

KELLERFLEX

FLEXIBLE SHAFT MACHINES

GIVE YOU BETTER FINISHING

with greater ease . . . at lower cost

THE VERSATILE *"Series M"* MACHINE

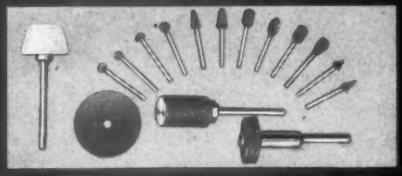
Use it anywhere in the shop . . . as a Floor Model, Bench Model or Suspension Model. Use it for power, for flexibility, for doing a better job faster, with less fatigue, at less cost.

16 constant shaft speeds — ranging from 1,000 to 6,000 or 2,000 to 12,000 rpm. Uses ¼, ⅓, ½ or ¾ hp motor.

A still wider range of speeds — ratio 1:3 — can be obtained by using Kollerflex High Speed Attachment.

THE SPEEDY JB-O MACHINE

Use P&W dental-type cables and handpieces for smaller work, and the standard JB-O cables and handpieces for the larger jobs. Either way, the JB-O features ample power and speeds from 800 to 9,000 rpm, or 2,500 to 10,500 rpm—without slow-downs or stops. Uses ⅛ hp motor.



Whatever the job—there's a P&W Tool to do it better. Recommended for the JB-O Machine is a full line of P&W Finishing Tools, including all shapes, sizes and kinds of HSS Burs, Carbide Burs, Grinding Wheels, Sanding Drums, Wire Brushes, Polishing Wheels.

Get full details on the "Series M" and the JB-O — and their accessories and attachments — from this single source of supply. Call any nearby P&W Branch Office at . . .

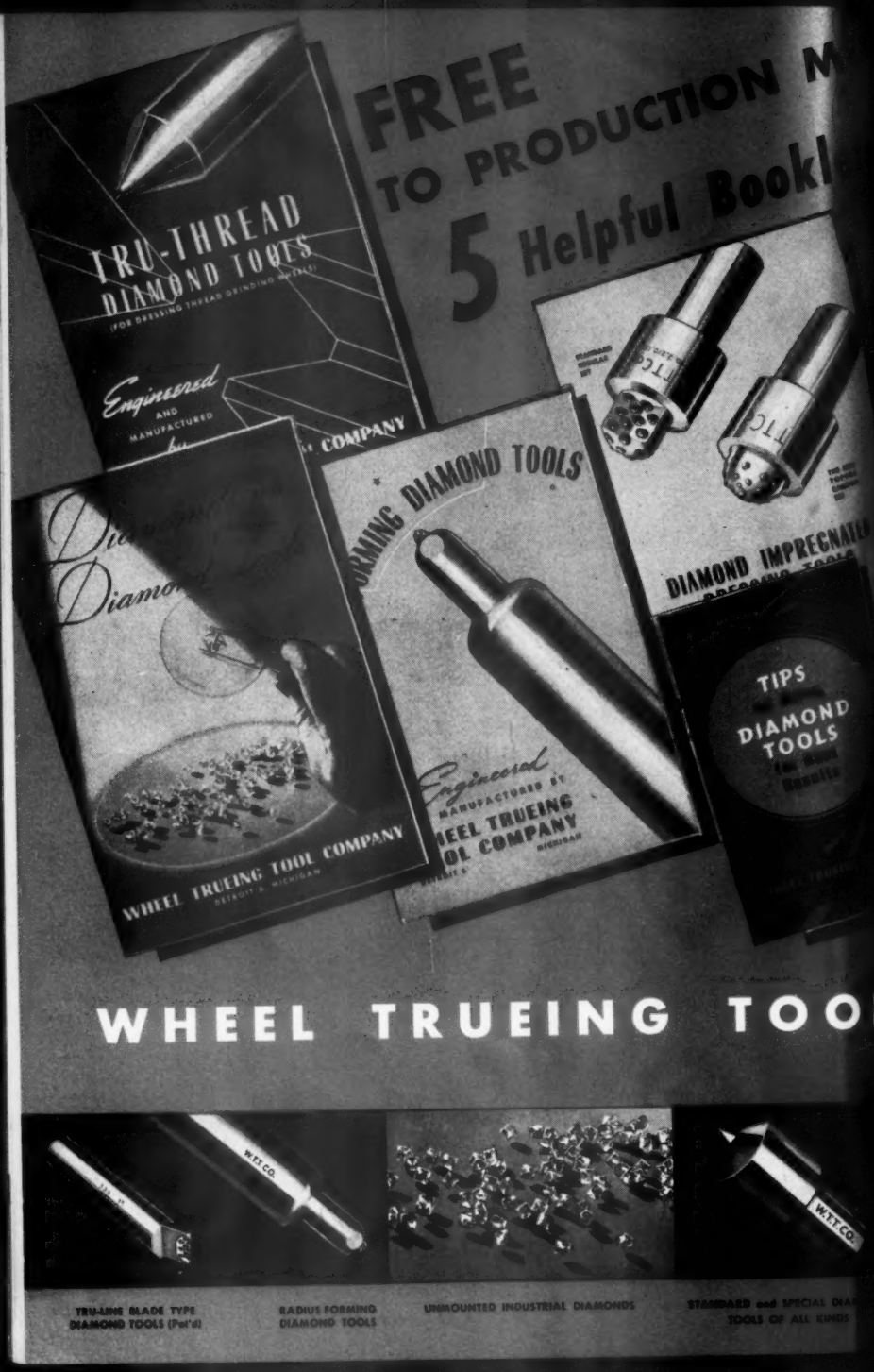
Birmingham • Boston • Chicago • Cincinnati
Cleveland • Dallas (The StanceCo.) • Detroit
Houston (The Stance Co.) • Los Angeles
New York • Philadelphia • Pittsburgh
Rochester • St. Louis • San Francisco

PRATT & WHITNEY

Division NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U. S. A.

Dedicated to Accuracy for 91 years


FREE
TO PRODUCTION M
5 Helpful Bookl
TRU-THREAD
DIAMOND TOOLS
Engineered
AND
MANUFACTURED
COMPANY
DIAMOND IMPREGNATED
FORMING DIAMOND TOOLS
Engineered
MANUFACTURED BY
EEL TRUEING
OL COMPANY
TIPS
DIAMOND
TOOLS
WHEEL TRUEING TOOL COMPANY
DETROIT 6, MICHIGAN
WHEEL TRUEING TOOLCO
TRU-LINE BLADE TYPE
DIAMOND TOOLS (Pat'd)
RADIUS FORMING
DIAMOND TOOLS
UNMOUNTED INDUSTRIAL DIAMONDS
STANDARD and SPECIAL DIA
TOOLS OF ALL KINDS

FOR 42 YEARS

AMERICA'S FINEST

DIAMONDS and DIAMOND TOOLS

For 42 years we have been supplying American industry with the pick of the world's industrial diamonds and with Truco Diamond Tools—"engineered to their job" and guaranteed to do it. If you like to select your own diamonds, send for our approval packages, assembled from one of the world's largest stocks of fine industrial diamonds. Or, give us tool specifications and we'll engineer and build for you tools guaranteed to deliver top performance. Fast service on specials and resetting.

The booklets shown at the left are yours for the asking, with our compliments. Write for them on your letterhead telling us how many of each you require to supply your organization. Please address your inquiries to our nearest company office.

☐ DIAMONDS and DIAMOND TOOLS ☐ TIPS ON USING DIAMOND TOOLS
☐ RADIUS FORMING DIAMOND TOOLS ☐ TRU-THREAD DIAMOND TOOLS
☐ DIAMOND IMPREGNATED DRESSING TOOLS

HAGAN
26, Illinois
BAEHR
Falls, Ohio
OOL & SUPPLY CO.
City, Missouri
Y COMPANY
18, California

LOY WRIGHT
Houston 11, Texas
WALTER F. GREENE & ASSOCIATES
Indianapolis 9, Indiana
WALTER F. GREENE & ASSOCIATES
Dayton 2, Ohio
WILLARD R. GATES
Grand Rapids, Michigan

H. F. SODERLING
Seattle 4, Washington
H. W. TWOGOOD
Los Angeles 32, California
W. OBLICK, LTD.
Hamilton, Ontario
MARVIN L. HUMKE
St. Louis, Missouri

H. IRVING STRINGER
Worcester, Massachusetts
ANDERSON MACHINE TOOL CO.
St. Paul, Minnesota
IRVING RIVKIN
Wheel Truing Tool Co. of N. J.
33 West Street, Bloomfield, N. J.
DIXIE TYPE & SUPPLY COMPANY
Birmingham 8, Alabama

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue
Windsor, Ontario, Canada

WHEEL TRUEING TOOL CO. OF NEW JERSEY
33 West Street
Bloomfield, N. J.

Wheel Dressers

LCOMPANY

Established 1910

3200 West Davison Avenue
Detroit 6, Michigan

ND CORING BIT
ed in mining

TRU-THREAD
DIAMOND TOOLS

BORING and TURNING
DIAMOND TOOLS

DIAMOND IMPREGNATED
WHEEL DRESSING TOOL

GIANT DIAMOND BIT
for oil well drilling

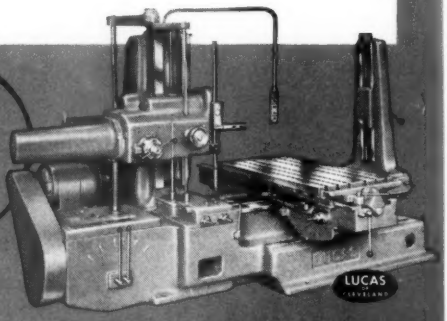
You can do 'most any job on a LUCAS

And . . . because you can do such a wide variety of operations on a Horizontal Boring Machine, it is today one of the most CRITICALLY NEEDED machine tools in the entire re-armament program.

The overwhelming demand for the LUCAS Horizontal Boring Machine, which embodies every important design improvement, many exclusive with Lucas, has built up a backlog of priority orders which make short time deliveries difficult.

Therefore . . . in appreciation of your preference for Lucas Machines, we gladly offer our services and suggestions on how better methods and improved operating practices can help you to step-up production on your present Boring Machine equipment until your new LUCAS can be delivered.

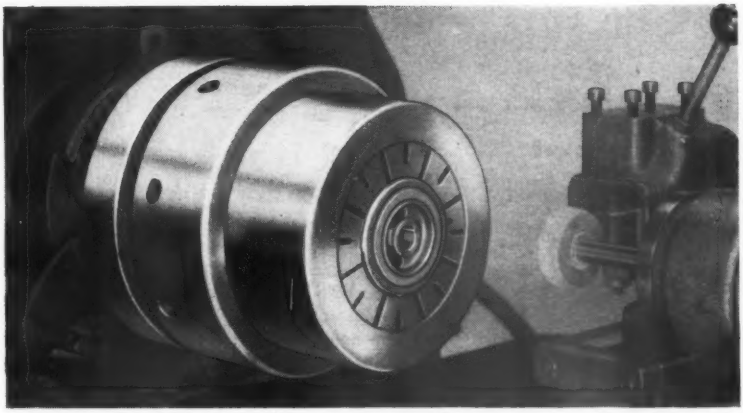
Automatic Power Positioning * Integrally cast 4-way beds with 4-point support * Complete range of feeds and speeds to one spindle * Pendant Control * Vibrationless V-belt drive to spindle at high speeds * Complete line of attachments * Chrome plated lead screws



LUCAS *Precision* HORIZONTAL BORING DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO., CLEVELAND 8, OHIO

Boring & Milling Machine

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION



The tail that wags the dog...

In today's industrial plants, where greater precision and more production are essential to successful operation, the efficiency and speed of costly machines are all too often limited by obsolete work or tool holding methods.

The need for a "tail to fit the dog" has resulted in the development of the world famous line of ERICKSON Precision Holding Tools.

An example illustrated above is an ERICKSON CHUCK holding a rotor for precision grinding of a shaft hole.

Results reported: concentricity is assured, cost of operation reduced drastically, rejects eliminated.

Think of these Erickson tools in terms of your production problems:

- **COLLET CHUCKS** — replace 7 single purpose collets, prolongs tool life, GUARANTEED accuracy of .0005" T.I.R.
- **FLOATING HOLDERS** — correct both angular and parallel misalignment.
- **AIR CHUCKS** — compact, fast acting, tremendous gripping power.
- **EXPANDING MANDRELS** — Erickson principles applied to I. D. holding along entire length of holding tool. Positive grip. Instantaneous operation.
- **SPEED INDEXERS** — operate by air or hydraulics, vertically or horizontally.

Write for Catalog "J" today

ERICKSON TOOLS
DIVISION OF THE ERICKSON STEEL COMPANY
2314 G HAMILTON AVE. • CLEVELAND 14, OHIO

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Tiny holes? . . . . . Easy!

Accurate holes? . . . . . Easy!

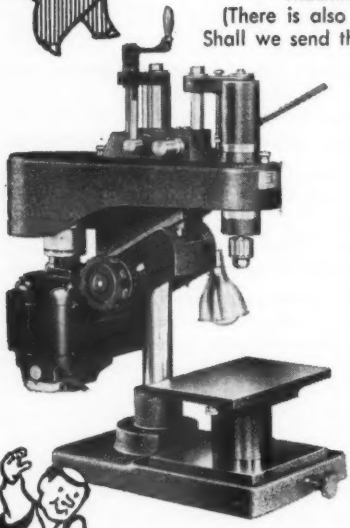
Holes on production schedules? . . . . . Easy!

***Tiny, accurate* holes on *production schedules*? . . . WOW!**

Hamilton Drilling Machines can do it!
And withdraw the drill undamaged
from hole after hole after hole!

LEARN HOW!

Write for the series of Hamilton Drilling Machine Bulletins and Price Lists.
(There is also a companion Tapping Machine.
Shall we send that bulletin along with the others?)



Shown here is the Hamilton Varimatic, Super Sensitive, Variable Speed, Small Hole Drilling Machine, one of four models, each particularly adapted to the work for which intended, all equally precise.

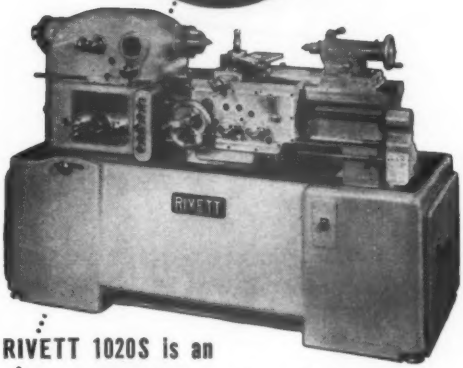
THE *Hamilton* TOOL COMPANY

832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

Drill Press

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

2 FOR 1



RIVETT 1020S

HAS WHAT IT TAKES TO MAKE AN OUTSTANDING LATHE

★ 40% heavier than comparable lathes. Weighs 3900 lbs. ★ Back gearing for power cuts—belt drive free of all gearing for high speeds. Range from 22 to 3600 R.P.M. ★ 12¾" wide hardened steel ways of bed absorb heavy cutting force. ★ Infinite spindle speeds through trouble-free mechanical drive. ★ Push button controls for complete operation. ★ Neutral clutch stops spindle without stopping drive. ★ Three bearing mounts for spindle. ★ Collets mount directly in spindle. ★ Hand wheel for turning headstock spindle.

RIVETT 1020S is an Instrument Lathe and an Engine Lathe

A double-duty machine—combining the feather-touch sensitivity of an instrument lathe with that heavy-biting ruggedness which carbide cutting tools require—qualifies for any turning within its 12½" swing and 20" centers.

Write for Bulletin 1020A

RIVETT LATHE & GRINDER, Inc.

Dept. TP-2 Brighton 35, Boston, Massachusetts

You can use other lathes . . . or employ other types of metalworking machines . . . but on no other tool can you get so much production with such fine precision as on a Rivett.

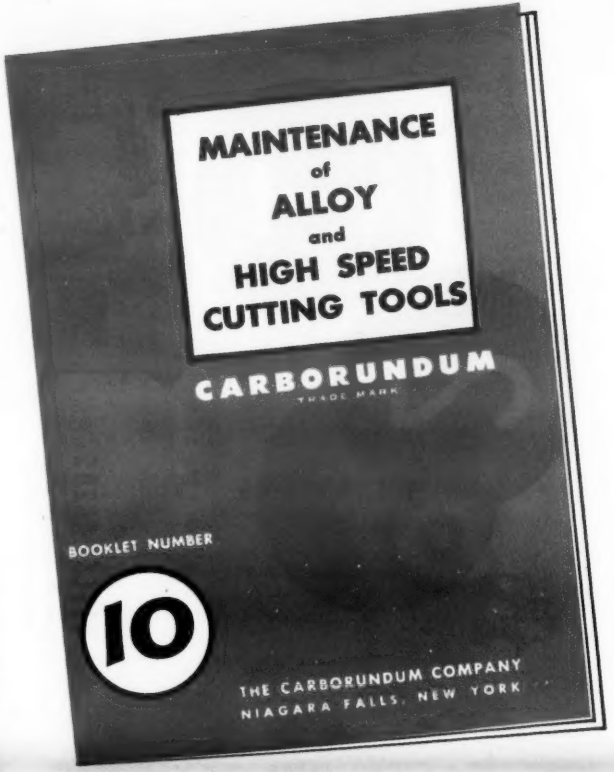
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

This New FREE Booklet tells HOW TO GET LONGER TOOL-LIFE

72
FACT-PACKED PAGES

Lathe and Planer Tool Grinding
Cutters and Reamers



New men to train? Defense contracts? New methods?
BOOKLET NO. 10, newly revised, is crammed full of

FACT-PACKED PAGES

- Lathe and Planer Tool Grinding
- Cutters and Reamers
  - Grinding Methods
  - Proper Clearance Angles
- Typical Tool Sharpening Setups
  - Spiral and Side Milling Cutters
  - Large Face Mills
  - Angular Cutters
  - Formed Cutters—narrow and wide face
  - Straight-toothed Hobs
- Reamers
- Thread Chasers
- Drills, Taps, Broaches
- Surface Grinding
- Cylindrical Grinding
- Internal Grinding
- Lapping in the Tool Room
- Grinding Wheel Grading Recommendations

New men to train? Defense contracts? New methods? BOOKLET NO. 10, newly revised, is crammed full of factual, easy-to-follow instructions for sharpening every kind of cutting tool. In addition to the subjects listed in the box, there are tables and diagrams on a wide variety of typical tools, showing the proper rake, clearance and cutting angle of each Pocket-size, handy to use, clearly and profusely illustrated, a treasure-house of valuable information. Send for your copy today. Use the handy coupon (you can staple it to your letterhead or paste it on a postcard).

SEND FOR YOUR COPY TODAY

THE CARBORUNDUM COMPANY, Dept. TP 81-54
Niagara Falls, New York

Gentlemen: Please send me — no obligation — a copy of your new Booklet No. 10 — "Maintenance of Alloy and High Speed Cutting Tools."

NAME _____ TITLE _____

COMPANY _____

STREET AND NO. _____

CITY _____ ZONE _____ STATE _____

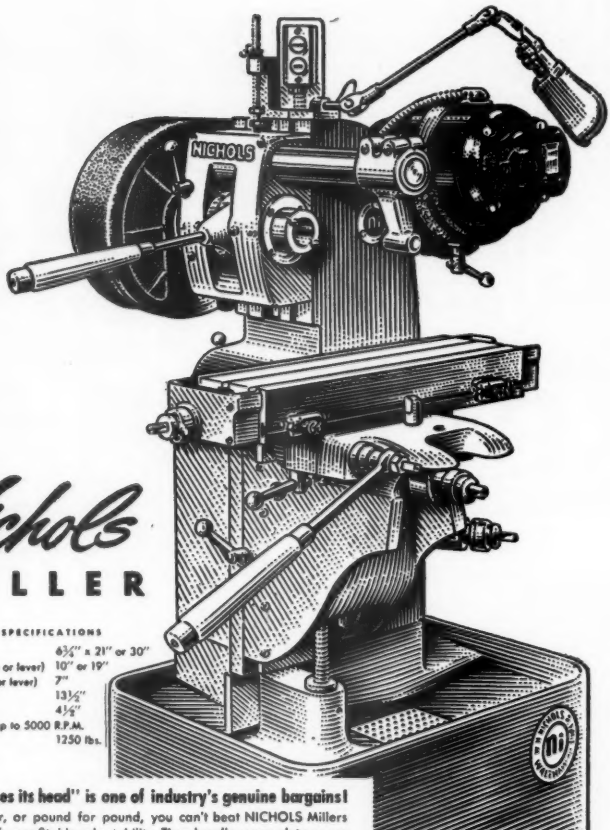
Only CARBORUNDUM

TRADE MARK

offers ALL abrasive products ...to give you the proper ONE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N. Y.

SEE ADVERTISERS INDEX, PAGE 163, FOR KEY NUMBERS



THE *Nichols* MILLER

CONDENSED SPECIFICATIONS

Table Working Surface	6¾" x 21" or 30"
Longitudinal Travel (screw or lever)	10" or 19"
Transverse Travel (screw or lever)	7"
Vertical Travel — Knee	13½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

"the miller that uses its head" is one of industry's genuine bargains!

Dollar for dollar, or pound for pound, you can't beat NICHOLS Millers for low initial cost or for profitable adaptability. They handle a complete range of conventional milling, both horizontal and vertical. Versatile Rise and Fall spindle heads can be locked in fixed position—or floated for profiling, broaching, drilling, keyseating, and similar plunge-cutting operations. Rapid lever feeds speed up many lathe-type operations such as turning, facing, boring and recessing.

There are lever, screw, and air feed models. Also three types of Double Spindle Millers. All are multi-purpose, work-devouring, uncomplicated machine tools, unexcelled in accuracy and fine workmanship.

MANUFACTURED BY W. H. NICHOLS COMPANY
WALTHAM, MASSACHUSETTS

Write for literature

NATIONAL DISTRIBUTORS **NICHOLS-MORRIS CORPORATION**

50-X CHURCH ST.
NEW YORK 7, N. Y.

Milling Machine

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Hjalmar Ellstrom

INVENTOR OF THE GAGE BLOCK

The achievement of perfection . . . the mastery of any art, craft, or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, or even lost in the conflicting claims of others who would seek the worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement used the world around was originally conceived and invented solely and entirely by . . . Hjalmar Ellstrom. Here, briefly, is the story of his accomplishment:

During the early 1890's Hjalmar Ellstrom was employed by the government rifle factory at Eskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom . . . *now measuring in millionths for three generations.*

ELLSTROM STANDARDS DIVISION

DEARBORN GAGE CO. • 22035 Beech St. • Dearborn, Mich.

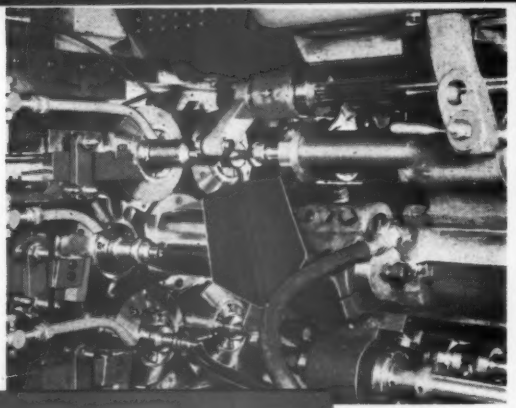
Originators of Chromium Plated Gage Blocks

What a relief!
Better Cutting--
Greater Tool Life
● Any good grinder hand can now produce this stronger, cleaner, faster cutting grind easy as regular relief. Let us send you our catalog that describes what D.S can do to cut your tool and machining costs. Illustrates the new motorized model.
D·S
Radial Relief
TOOL GRINDING
FIXTURE
Available with or without grinder and base.
D · S GRINDER DIVISION
Royal Oak Tool & Machine Co.
621 E. Fourth St. • Royal Oak, Mich.

Case histories have appeal, whether they're about someone's time being bettered at a lathe or at an altar. Success likes success, and "misery likes company."

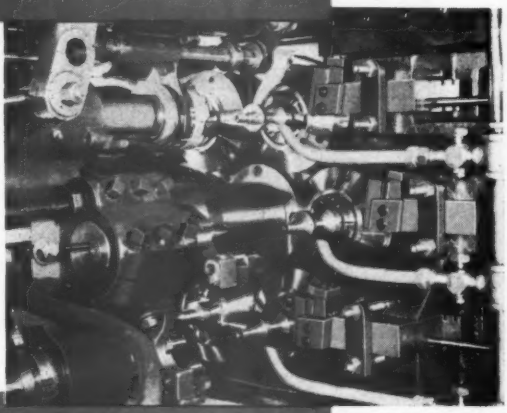
An "automatic's" case history is just an *end* of a *means* of machining facility. If you procure the right facilities, good case histories will result in *your* plant.

When selecting the best multi-spindle automatic facility for *your* needs, you will want to compare *all brands*. But you should have *full* information for a thorough comparison. You can have it on CONOMATICS.

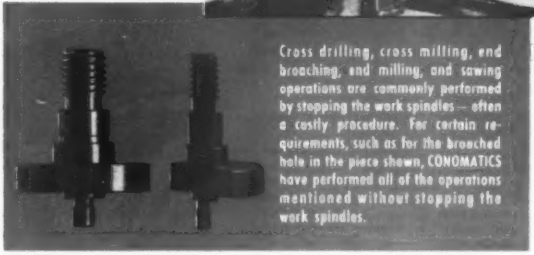


Front Side of Tooling Area 1-5/8-SIX

THE FACILITY BEHIND THE NEWS

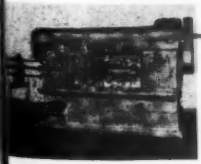


Rear Side of Tooling Area 1-5/8-SIX



Cross drilling, cross milling, end broaching, end milling, and sawing operations are commonly performed by stopping the work spindles—often a costly procedure. For certain requirements, such as for the broached hole in the piece shown, CONOMATICS have performed all of the operations mentioned without stopping the work spindles.

A Comparison of ALL Automatics is in favor of Cone



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Lathe: automatic

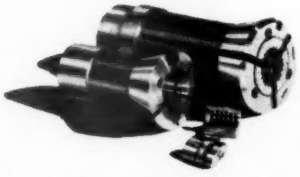
HARDINGE ELMIRA, N.Y. Master Collets and Pads for MULTIPLE SPINDLE AUTOMATICS

Equip your multiple spindle automatics with HARDINGE Master Collets and Pads—for solid collet performance at low cost.

Available for the following machines up to and including 3½" capacity: Cone; Greenlee; Gridley and Acme-Gridley; National Acme and New Britain.

- Size changes permitted without removing collet from Spindle.
- Final tightening possible for pads when closed on bar stock.
- Lower cost - compare pad price with solid collet, and you will standardize on Hardinge Style "S".
- Design affords maximum strength.
- Greater accuracy — because pads are ground accurately on an arbor.
- Lower inventory possible — pads interchange among different makes of automatics with similar capacity.

Hardinge Style "S" Sure Grip Master Collets and Pads



Write for Style "S" Bulletin—contains complete descriptions, specifications, and ordering information.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

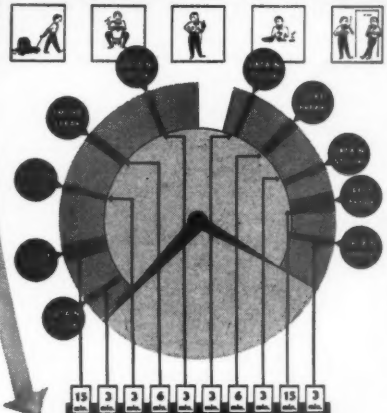
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

DO YOU KNOW ... *that almost every automatic machine* **LOSES ONE HOUR** *of productive time each day?*

SAVE the LOST HOUR

and increase production 12½ to 22% with

PROTECTRON



IT'S A FACT! The time lost while operators leave their machines for morning and afternoon "breaks" and to procure and ready new stock mounts up little-by-little until it reaches at least an hour by the end of the day. That's the **LOST HOUR** . . . the hour during which your investment in plant and equipment produces absolutely nothing. But you can reclaim the **LOST HOUR.** Scores of **PROTECTRON** users have discovered that as **PROTECTRON** monitors . . . machines continue to run, even when unattended. The **LOST HOUR** becomes a productive hour with an increase in output of 12½% to 22%. It's like getting nine hours worth of production from an eight hour shift.

IT'S A FACT! PROTECTRON also reduces tool and die breakage as much as 86% • Saves 300% in manpower, since one man can safely operate four machines, thus releasing three men for other work • No other device can save your plant so much money . . . so quickly . . . at so little cost • Prove it to yourself. Write for all the facts . . . today.

The Brinnell Company

Presses: Safety Equipment

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

A GREAT GRINDER FOR FINISH

Here's the surface grinder that's fast — that holds size accurately — that produces work of extremely fine surface finish. It's the ABRASIVE No. 3B, the right grinder for countless production and tool room jobs.

No. 3B has been selected by leading industries because of its massive construction; the bed and upright are a single casting, heavily ribbed and reinforced to furnish utmost rigidity. This original ABRASIVE design-feature accounts, in part, for the power, stability, and endurance of the No. 3B. Other important features are:

- easy vertical adjustment of head with graduated (.0001") handwheel
- built-in wear adjustments
- automatic (power) longitudinal and cross feeds
- box-type saddle
- hydraulic table shock absorbers
- big capacity: 24" long x 8" wide x 12" high
- 3 H.P. motor (5 or 7½ H.P. for special work)
- super-precision, cartridge-type spindle
- one-shot lubrication system

It will pay you to get detailed facts and figures about Abrasive No. 3B and No. M3 Surface Grinders. Send for catalog. ABRASIVE MACHINE TOOL CO., 16 Dunellen Road, East Providence 14, Rhode Island. Distributors throughout the world.

No. M3 Motorized Spindle Surface Grinder

This grinder has all the features of the No. 3B, plus the motorized spindle. No. M3 is widely used in the production of interchangeable parts . . . in the toolroom and on the production line.

Abrasive Quality is Reflected in the Finish of Your Product

ABRASIVE
ACCURACY BOOSTS PRODUCTION

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

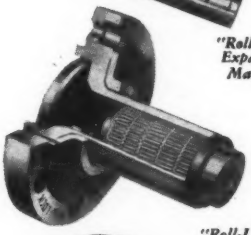
THE NEW CHUCKING TOOLS

POWERFUL AND ACCURATE

. . . for precision work

SCULLY-JONES

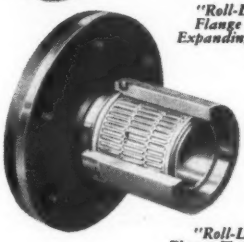
"ROLL-LOCK"* CHUCKING TOOLS



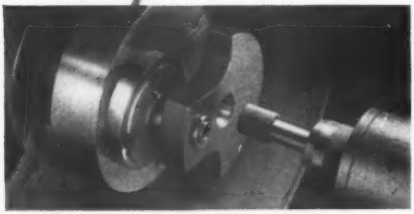
"Roll-Lock" Expanding Mandrel

"Roll-Lock" Mandrels, Arbors and Chucks use a new chucking method for holding work or tools. This method takes advantage of the elastic properties of metal.

When a very little turning force is applied to actuating ring or cone, the powerful wedging action of rollers expands or compresses the chucking surface to a shrink fit. This permits maximum torque and thrust to be transmitted, assuring accuracy often less than .0001". "Roll-Lock" Chucking Tools are engaged or disengaged quickly and easily. Yet the shrink fit cannot be loosened by reversing the rotation of the tools or by shock and vibration.



"Roll-Lock" Flange Type Expanding Arbor



"Roll-Lock" Flange Type Chuck

Shown to the right are two of the many applications in turning, grinding or inspection operations. "Roll-Lock" Flange Type Expanding Arbor and Tool Chuck being used in a finish grinding machine for holding the work and grinding tool.

**"Roll-Lock" is a trade mark of Scully-Jones and Company.*

WRITE FOR BULLETIN No. 17-50

giving detailed description and technical data on these and other "Roll-Lock" Chucking Tools.

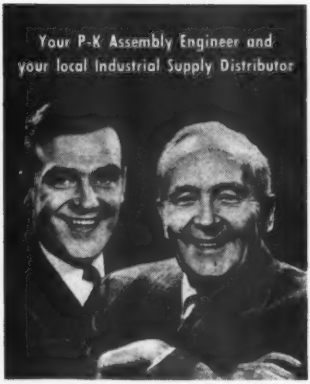
Scully-Jones AND COMPANY

1913 S. Rockwell St., Chicago 8, Ill.

R69-2MT

YOU GET LOW COST FAST ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS



Teamed up to help you step up assemblies

Working side by side in every industrial center throughout the nation, this pair of experts is solving many difficult problems of planning and procurement.

The P-K Assembly Engineer is a fastening expert, fully qualified to help you plan faster, better, lower cost assemblies.

Your local Industrial Supply Distributor is an expert in procurement, with complete experience and facilities for simplifying your supply problems.

They can show you why Parker-Kalon Fastening Devices have made record savings in assembly time and cost in over a million applications.

Ask this top-notch team to sit in with your production staff. They'll give you the kind of help you need today more than ever. Parker-Kalon Corporation, 200 Varick Street, New York 14.

PARKER-KALON®

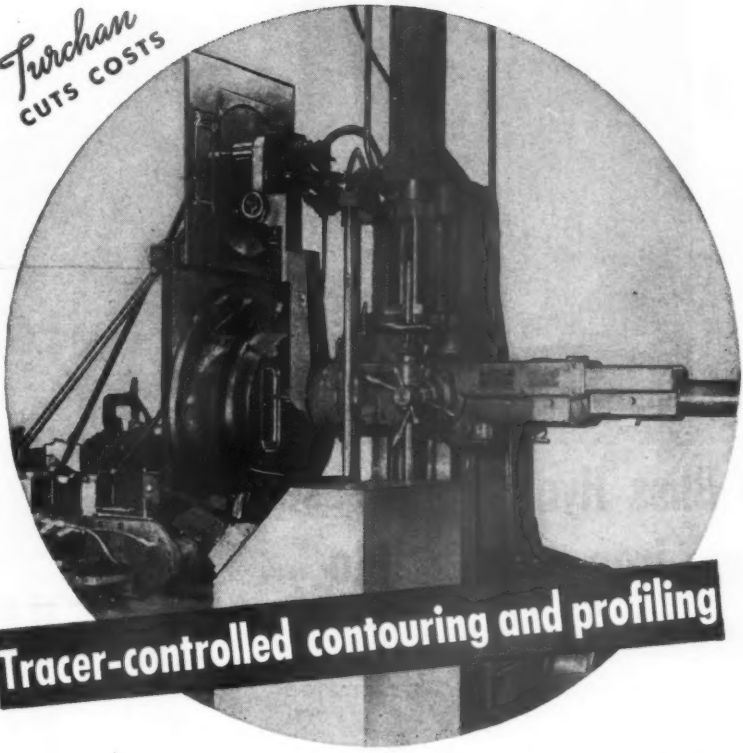
The Original **SELF-TAPPING SCREWS**

Cold-forged **SOCKET SCREWS**

AND OTHER FASTENING DEVICES

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Turchan CUTS COSTS



Tracer-controlled contouring and profiling

Tank turret openings are rapidly machined by Turchan Follower attachment without the necessity of specially built equipment or skilled help, to accuracies well within the required limits. In this application the tracer handles 360° control with hydraulic drives attached to the vertical and cross feeds. Once the milling is started the tracer follows the template and automatically controls movement of the cutting tool, requiring attention only when the tool reaches a corner. Any type of standard boring mill can be similarly equipped. There are also Turchan Followers for planers, shapers, lathes and grinders. Tell us your problems.

Turchan puts standard boring mill on automatic basis to produce wider range of work, faster and better for armament needs.

Turchan FOLLOWER MACHINE CO.

OLDEST MANUFACTURER OF HYDRAULIC ATTACHMENTS FOR MACHINE TOOLS

GET ALL THE FACTS—WRITE FOR DESCRIPTIVE FOLDER

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Duplicating Machines

8 Bliss Hydraulic Presses form iron powder into complex turbine blades

Intricate aircraft turbine blades, particularly complex due to the great change required from body to root, are molded from iron powder, coined and straightened in special Bliss hydraulic presses with duplex actions at Thompson Products, Inc. Thompson's engineers credit the process and Bliss presses with these advantages:

(a) *Conserving critical metals and materials*

(b) *Minimizing machining requirements*

(c) *Holding tolerances to ±0.003 in. to airfoil contour... ±½ degree of twist*

(d) *Excellent tool life—tool steel dies deliver up to 250,000 parts*

(e) *Require relatively light pressures*

Features of the Bliss hydraulic presses include dual flow pumps, rapid advance and return speeds, variable pressing speeds, automatic reversal, automatic speed change, overload protection, plus numerous other safety devices and construction refinements.

Bliss has led the way for years in the development of presses to form metal powders...has installations in leading plants using the technique. This experience is yours when you call on Bliss with your equipment problems.

E. W. BLISS COMPANY, Canton, Ohio

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

From a Single Press for a Given Job...to a Complete Press Room...

It's Bliss

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

CARBIDE GAGES

Are the Answer

To Today's Increased Inspection Requirements

Carbide gages offer you at least fifty times the inspection usefulness of ordinary steel gages.

For high production inspection, it is a definite contribution to the present Defense Program to specify wear-resistant gages. When carbide gages are used, production capacity which could be tied up in the manufacture of steel gages is released. Production of other urgently needed types of gages increases . . . deliveries of all gages are speeded up considerably.

Of equal importance, in carbide gages, wear allowance can be reduced to a minimum and production departments automatically get the benefit of full manufacturing tolerances. That means the elimination of rejects due to the use of "well within limits" gages . . . and the results of expensive man-hours and machine time are not consigned to scrap.

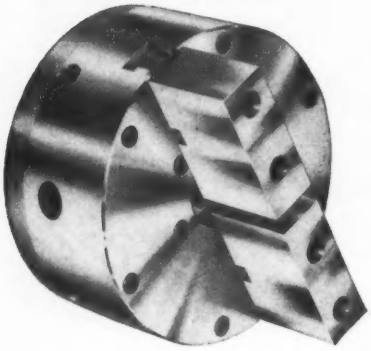
And today, as in the past, Lincoln Park offers the experience and facilities to produce ***the best*** in gages of this type.

Lincoln Park **INDUSTRIES, INC.**

1731 FERRIS AVENUE • DETROIT 25, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Buck ADJUST-TRU CHUCKS



NEW 2-JAW AVIATION CHUCK

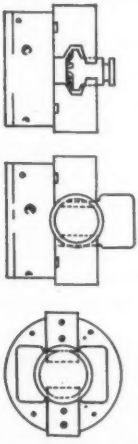
THIS is the slickest way ever devised to hold irregular shaped parts for duplicate machining operations within *.0005 precision.*

The master jaws have *soft* top jaws which you machine to hold your specific work, then harden if you wish. That's not new. But the way the Adjust-Tru principle saves time on accurate rechucking is truly amazing. The jaws move in and out simultaneously to grip the work with a *single-pinion* action — just like any scroll chuck.

You make but one adjustment for precision when you start your run — then re-chuck with scroll chuck speed without further adjustment.

Ask for a catalog with full details.

Holds Odd Shaped Parts



BUCK TOOL COMPANY
218 Schippers Lane
KALAMAZOO, MICHIGAN

GET INTO PRODUCTION

Faster!

SEND FOR YOUR FREE COPY OF THIS NEW BOOKLET TODAY!

You save time when you "tool up" with Danly Die Sets . . . preferred by diemakers everywhere. Check the unique precision features that mean faster die completion and longer production runs . . . see how the nationwide system of Danly assembly branches reduces costly delivery delays. Write for your copy now . . . Danly Die Sets are certain to help you meet production schedules.

DANLY

DANLY MACHINE SPECIALTIES, INC. 2100 South Laramie Avenue, Chicago 50, Illinois

ENGRAVING and MARKING

The Green Engraver

DIAL STENCIL

BARREL DIAL

DIRECTIONAL SIGN

ENGRAVES, ROUTS, PROFILES and MODELS

A real money saver for industry. Proven by the experience of tool and die, electronic machine, radio, electrical and instrument manufacturers.

The Green Engraver zips out precision work on metal, plastics, wood, glass, hard rubber etc. . . . . engraves panels, name plates, scales, dials, molds, lenses, instruments, instruction plates, directional signs . . . by simple tracing. *Routing, profiling and three dimensional modeling indicate its versatility.* Electric etching attachment available.

Specify the Green Engraver for the best in low cost performance. Special attachments and engineering service available for production work.

FREE — Fact-packed folder yours upon request.

Green Instrument Co.

380 Putnam Avenue Cambridge, Mass.

EDITORIAL INDEX

Editorial: 61

—features—

"Machining Armor Steel Castings" 63
The solution to the tooling problems for machining the "Driver's Hatch" and the "Commander's Vision Cupola" as performed at Cadillac's Cleveland Tank Plant is presented in this article.

"Carbide Tooling on Small Lots," by James MacFadyen 65
By developing their own styles of carbide tools for machining different types of materials, Warner & Swasey has successfully applied carbides to small lot runs.

"Sound Approach to Carbide Tooling on Multiple Spindle Automatics Helps to Insure Success," by Merrill Barden, Jr. 68
Tooling multiple spindle automatics with carbide tools presents many problems which the uninitiated might not expect, but Mr. Barden details the procedures which will lead to success.

"The Application of Mechanically Held Carbide Tools," by M. L. Backstrom 70
The advantages and disadvantages in the use of brazed and mechanically held carbide tool tips are discussed by Mr. Backstrom.

"Work Handling at the Press," cont'd., by John E. Hyler 72
In this second part of Mr. Hyler's article on work handling equipment, he deals mostly with feeds, ejectors, unloaders, hoppers and stacking chutes.

"Trends in Carbide Tooling," by Bennett Burgoon, Jr. 74
Developments in the application of carbide tools are illustrated by Mr. Burgoon through his demonstrations in the use of carbide insert cutters as applied to heavy work.

"Fundamentals of Carbide Tool Grinding," by Ramsay M. Bell 78
Mr. Bell has presented the material in this article in such a manner that it can well be used as a refresher to

those now using carbides and as a guide for new grinding room personnel.

"Machining Titanium Alloys" 80
A report on the machining of titanium alloys showing the types of cutting tools which give the best results in turning, milling, cut-off operations, and drilling and tapping.

"Forge Plants Can Be Safe Plants!" by Charles D. Brainerd 144
Mr. Brainerd takes the reader through an imaginary forge shop and points out the hazards which are present.

"Correct Wheel Shape Contributes to Diamond Conservation," by E. T. Larson 194
The demand for diamond wheels has put diamonds on the list of critical materials.

—shorts—

Using Tungsten Carbide for Wear Resistance 82
More Machine Tools Not Enough 127
Clinch Nuts Inserted by Conventional Dies 186
Military & Industrial Production New 188
Helical Inserts Expedite Bolster-Plate Thread Repairs 190
High Strength, High Temperature Die Steel for Cold Hobbing 192
Cutting Graduations with Speed and Accuracy 200
1952 Forecast: N.T.D.M.A. 204
Air Hardening Flat Die Steel 216
Carbide Milling of Die Blocks 218
How's Your T.V. Interference? 219
Handling Turret Lathe Work on a Small Lathe 220

—departments—

"SHOP AIDS" 128
We've briefed the content of these catalogs to save you time in getting information on your requirements.

"PUBLICATION PREVIEWS" 158
Here's a wealth of information, but too much to carry in your head. Study it over and file it; then you'll have it when you need it.

"QUICK-PIC CATALOGS" 180
Here we've practically put some of today's newest literature up on a rack ready for you to take your pick.

"PROGRESS ON PARADE" 206
Each and every one of these new machines, tools and accessories is capable of saving money or increasing productivity on a job that may be baffling you; or of performing a new job that has come up.

52100

STEEL TUBING and BARS

Tops for...

★ HARDNESS

★ LONG WEAR

★ TENSILE STRENGTH

★ MACHINABILITY

★ And tops for use in a long list of machine parts and tools

Over 200 tube sizes from .898" O.D. to 8.250" O.D. Bar sizes from .171" round to 7.5" round. Also Ring Forgings.

Write for a copy of our latest stock list today.

PETERSON STEELS, INC.

DEPT. T, SPRINGFIELD ROAD
UNION, NEW JERSEY

Detroit, Mich. • Chicago, Ill.

Steel: Tool

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

New Flexible Sealing...

T-J AIR CYLINDER

Designed with revolutionary application of

Super-Cushion

It's *sealed with pressure*—a revolutionary T-J application of flexible sealing that insures positive cushion action combined with automatic valving action for fast return stroke . . . eliminates binding and sticking . . . operates with *low friction, minimum wear,* and *added power* due to higher efficiency.

More PLUS features! New type packing nut incorporates a piloted diameter, assuring perfect alignment. Improved rod packing increases sealing efficiency. Piston rod and internal cylinder tube surfaces are hard chrome plated—a standard practice with T-J for over 15 years. Basic design is safety-stressed for air line pressures up to 100# PSI. Write for bulletin 252 . . . The Tomkins-Johnson Co., Jackson, Mich.

1. Metallic rod scraper to protect rod bearing and packing from dirt and grit.
2. Wrench flats.
3. Self-adjusting chevron type packing.
4. Permanent type adaptor ring.
5. Hi-tensile tie rods.
6. Heavy duty, hard chrome plated rod.
7. Generous fillet reduces stress concentration.
8. "O" ring static seal.
9. T-J new flexible cushion seal insures positive cushion with automatic valve action for fast return stroke. (Patent applied for)
10. Fine cushion adjustment.
11. Heavy wall precision honed hard chrome plate.
12. Controlled packing compression with metal to metal contact.

36 YEARS' EXPERIENCE T-J

TOMKINS-JOHNSON

DIVISIONS: AIR AND HYDRAULIC CYLINDERS, FILTERS, STEAMERS

See us in Booth #1927
ASTE Industrial Exposition
Chicago . . . March 17-21

editorial

"the well-springs of profit"

For us to write an editorial on such a subject as the profit-making productivity of machine tools undoubtedly seems, at first thought, about as non-productive an expenditure of time as attempting to guild the lily or hauling coals to Newcastle.

And why?

Simply because, of all people, you who read TOOLING and PRODUCTION are the ones who least need to be told the facts of life; a machine tool's life, that is. Because you constitute the metalworking industries' manufacturing management, your daily bread and butter depends upon your ability to procure the newest and best in machine tools and to get the most, tooling and production-wise, out of machine tools. We certainly can't tell you anything about the profit-making productivity of machine tools that you don't already know.

As a consequence, we are fully aware of the importance of the functions you are performing and of the responsibilities that are yours in keeping production in high gear in the face of the many obstacles imposed by an attempted guns and butter economy, inflation and rising costs, and material shortages and cutbacks.

It is because we appreciate your problems that we welcome any opportunity whereby we can be of possible assistance.

We know that you have to deal frequently with people who don't know as much about the machine tool facts of life as you do. These people may represent your comptroller's office or purchasing department, your finance committee or your board of directors.

We know that you welcome any ammunition that will help you to make your needs known and to loosen the purse strings so that you can throw out those old clunkers and get some up-to-date, productive and profitable machines.

The sole purpose of this editorial is to tell you where you can get a bit of the finest ammunition to use on any "uninitiated" that it has ever been our pleasure to study. We are referring to "The Well-Springs of Profit," a booklet of sixteen potent pages by Frederick V. Geier, President of the Cincinnati Milling Machine Company.

This is a reprint of an address Mr. Geier gave at the recent convention of the American Bankers Association. It is a wonderful non-technical summation of what the machine tool has done and can do for our economy. It shows that there is nothing more expensive than an old machine. It is jam-packed with the kind of information that is food and drink to financial men.

If I were the proprietor of a contract shop and needed to float a loan in order to purchase a couple new machines, I would certainly see to it that my banker had a chance to read "The Well-Springs of Profit" before making my touch.

Or, if I were a member of the tooling and production team in the largest of plants, I would see to it that all wielders of the corporate purse strings were presented with copies of "The Well-Springs of Profit."

Mr. Geier presents the case far better than we could. Why not take advantage of his know-how? We have a few extra copies and we will be glad to send you one. If you want several, you'd better write to Mr. Geier.

E. Willard Pennington

editor

WESSON

28 YEARS OF EXPERIENCE IN ENGINEERING AND DESIGNING SPECIAL CARBIDE TOOLS

DO THE JOB BETTER . . . FASTER . . . AT LESS COST . . . USING

WESSON *Special Carbide Tools*

★ ELIMINATE TOOL CHANGES
★ COMBINE OPERATIONS
★ INCREASE SPEED AND FEEDS

SEND US YOUR BLUEPRINTS

- SPECIAL REAMERS
- SPECIAL COUNTERBORES
- SPECIAL MULTI-DIAM. TOOLS
- SPECIAL END MILLS
- SPECIAL FACE MILLS
- SPECIAL CORE DRILLS
- SPECIAL MILLING CUTTERS
- SPECIAL TOOL HOLDERS
- SPECIAL CARBIDE TIPS
- SPECIAL CARBIDE BLADES
- SPECIAL CARBIDE SHAPES
- SPECIAL FLAT TOOLS

Wesson's experience in carbide began over 28 years ago when Wesson first applied "Widia Metal" the original Krupp Carbide to metal working tools in 1923.

Wesson's experience and production facilities give you a combination of manufacturing skill and engineering "know-how" that cannot be matched.

"Wessonmetal" the carbide produced exclusively in Wesson Metal's own plant—and Wesson Tools have established records in America's leading industries for outstanding production.

WESSON COMPANY *Affiliated with* **WESSON METAL CORPORATION**

1220 Woodward Heights Blvd., Ferndale (Detroit 20), Mich.

PIONEERS IN THE ART OF DESIGNING AND PRODUCING CARBIDE TOOLS

Machining Armor Steel Castings

Fig. 1. Two of the rough castings for the Driver's Hatch. Locating pads are identified at points "A", "B" and "C". The ungainly shapes of the castings and the variety and positions of the openings to be finish machined convey an idea of the fixturing problems involved.

Several problems are presented in machining armor steel castings. To show these problems and how they were solved at Cadillac's Gleveland Tank Plant, two parts typical of the various types of operation were picked.

The first part which will be discussed is the Hull Roof Casting, more commonly called the "Driver's Hatch." The machining of this part calls for the three basic types of operations; turning, milling and drilling.

Armor steel castings due to various factors involve larger amounts of finishing stock than is normally encountered. The material is also machined in its heat treated stage, which means heavy machine tools and fixtures are required. Due to the speed with which the Cadillac program was put underway, new machine tools of the type required, in many instances, were unavailable. To counteract this situation, government machines were re-activated and, in some instances, used machines were purchased. These machine tools were not always of the type best suited for the operation. For efficient performance, secondary equipment was purchased and installed; mainly, follower duplicating units on milling machines and horizontal boring mills.

Previous to any machining, all castings at Cadillac are inspected and qualified for location points and clean-up stock. Figure 1, a view of the rough casting, shows the three locating pads, A, B and C, very clearly.

The Driver's Hatch presented several

These two action shots of the Walker Bulldog Tank show the two components used in the article as examples of machining armor plate, i.e., the Hull Roof Casting or "Driver's Hatch" and the Commander's Vision Cupola. The editors of TOOLING and PRODUCTION wish to acknowledge the capable and painstaking assistance of Tank Plant Engineers Harry Snodgrass and B. P. Stainbrook in the preparation of this feature. E.W.P.

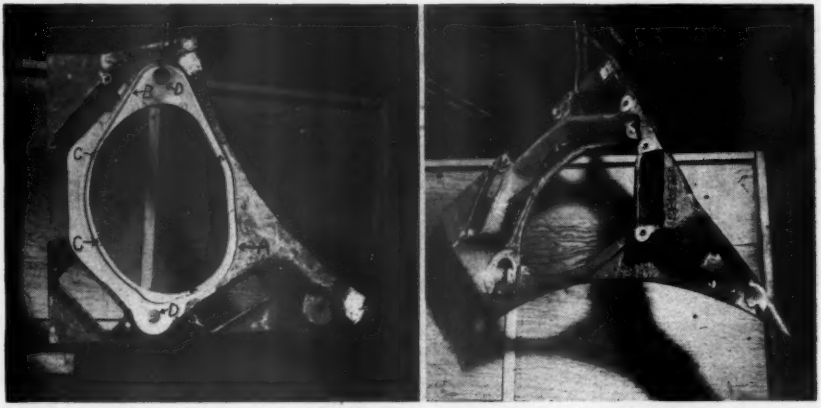


Fig. 2. Face views upper and lower machined surfaces of hatch. The one long edge presents a segment of arc which is cleaned up by boring. This, the first operation, also includes cutting the welding scarf angles. Subsequent machining operations are profiling, "A"; seal slot, "B"; tabs, "C"; and hinge holes, "D".

interesting problems in tooling. As can be seen from the photograph, Figure 2, there is a segment of an internal bore with scarf angles for welding. It was determined that this would be the first machining and that this edge would be used for subsequent locations.

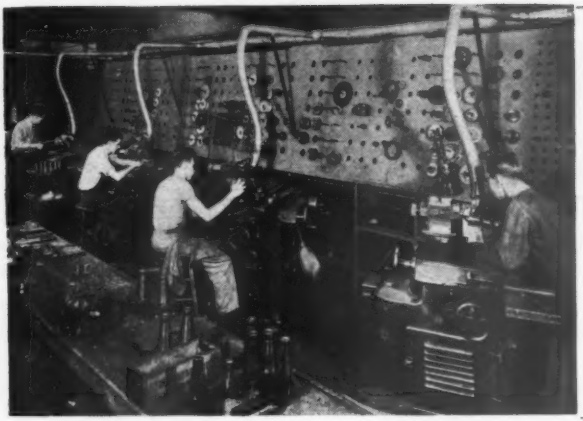
A 14′ vertical boring mill was needed to clear this part and all that was available was a 14′ mill with only a 108″ table. It was determined that a sub-table be made and used for a fixture base. A 13′6″ cast iron plate, 4″ thick, was cast for this purpose. Because of the large size of the plate, it was machined on the mill and then doweled in place. The fixture details were made to accommodate four workpieces and the necessary holes were laid out on the cast iron plate.

Fig. 3. Showing clamping method of one of four castings as mounted on sub-table of the boring mill. Machining four castings in one setup presents a severe interrupted cut.

Due to the large number of holes to be drilled and tapped, a six foot radial was set up next to the vertical boring mill and all the drilling and tapping were done without removing the plate from the boring mill. The actual cutting was done with two carbide-tipped tools ground with a 5° negative rake angle to meet the rather severe intermittent cut encountered when cutting four castings at a time. The scarf angle of these tools was form ground and one of the tools can be seen in Figure 3, which also shows the casting clamping methods.

The second operation consisted of blocking the three straight sides to size, milling the front periscope opening and cutting the scarf angles on the three straight sides. This was done because it was felt that greater accuracy could be held and that the time saving in changing a light cutter, instead of a heavy, unwieldy casting, would constitute a fairly large saving. This operation was performed on a number #5 horizontal mill equipped with a follower device designed to control the

(Continued on page 94)



by

James McFadyen

Cutting Tool Supervisor

The Warner & Swasey Company

Cleveland Ohio

Fig. 1. One corner of the Warner & Swasey central tool grinding department.

Carbide Tooling on Small Lots

Generally people think of carbide tools in connection with high production, but at Warner & Swasey where the average lot is approximately 30 pieces, our thinking must be in terms of small lot production.

Our experience over the past 12 to 15 years has shown us that carbide can be used to good advantage on small lot production if a clear-cut program is followed. During this time hundreds of thousands of operations have been successfully tooled with carbides both on Warner & Swasey's own work and on work for outside concerns. It is also interesting to note that most of these jobs have been tooled with standard cutters incorporating only slight variations.

Advantages of Making Your Own Tools

Although our standard designs do not vary greatly from those recommended by the carbide suppliers, we have found that the development of our own styles has resulted in tools that meet shop requirements more effectively (see Figure 2). Most of these standard tools are made in our Carbide Department. The shanks of most of these tools are of high tensile cast iron made from patterns furnished to the foundry. These castings allow us to pre-cast many standard shapes, thus reducing the machining necessary to a few simple operations.

We have found that there is a considerable saving in making our own tools and furthermore we can do many things we might hesitate to do if the cutters were purchased. For instance, Figure 3 shows how with a simple milling operation, the standard cutter on the left was changed to the one on the right. The milling operation was done before brazing so that a standard tip of the proper dimensions could be utilized. If the standard cutter had been purchased, a great deal of grinding would have been necessary to change the shape. Such heavy grinding practice not only wastes a great amount of carbide, but also literally grinds away the life of the tool.

One of the most remarkable characteristics that we have found in making our own carbides is the speed with which a tool can lick a job. Many times we have produced a very efficient tool in approximately one hour by brazing a carbide tip to almost any piece of cold rolled stock.

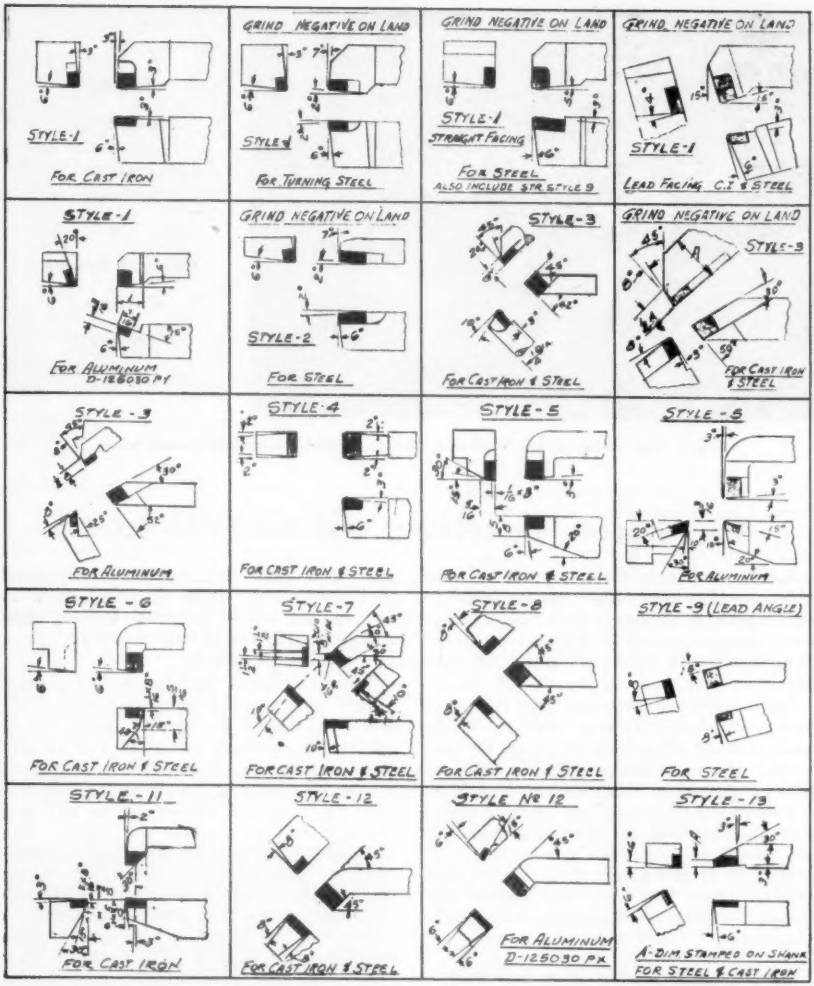
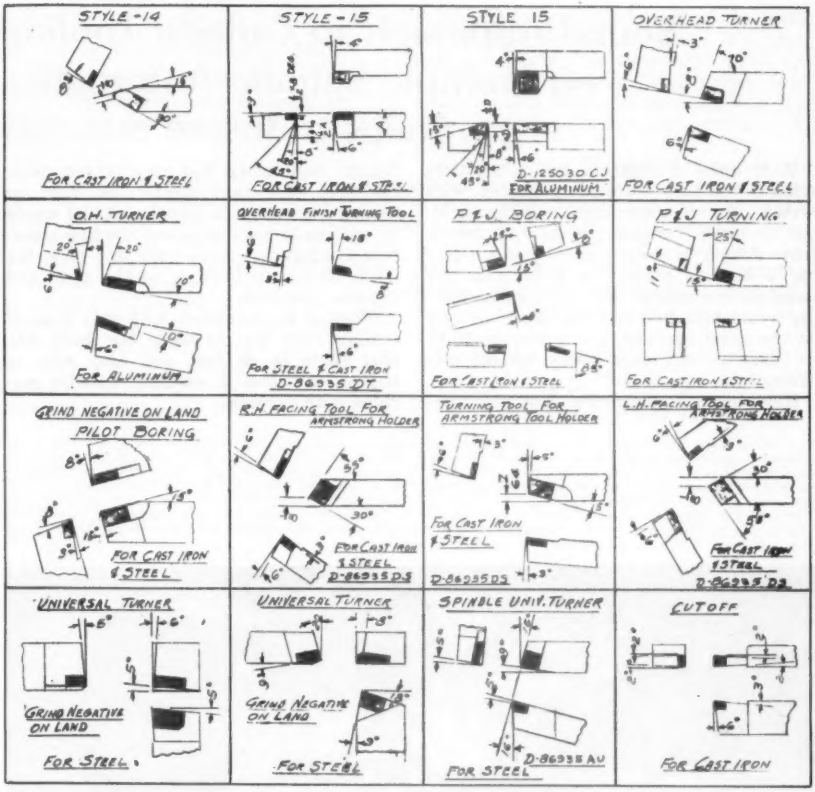


Fig. 2. The standard styles for single point cutters established at the Warner & Swasey Company. Although these standard designs do not vary greatly from those recommended by the carbide suppliers, it has been found that the development of these styles has resulted in tools that meet shop requirements more effectively. Most of these standard tools are made in the Warner & Swasey Carbide Department. The shanks of most of the tools are of high tensile cast iron made from patterns furnished to the foundry. This procedure permits the pre-casting of many standard shapes, thus reducing the machining necessary to a few simple operations.

It has been found at Warner & Swasey that there is a considerable saving in making their own tools and that there are many things that can be done on which there would be some hesitancy if the cutters were purchased.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION



Breakage: Its Causes and Control

In using our standard tools we expect and get breakage, but we do not investigate the breakage unless our records show it is excessive. If and when this happens, and we have not already been called by the foreman to investigate, a tool technician is sent from the department to see if he can determine the trouble.

It is surprising how excess breakage falls into a general pattern so that in most cases trouble can be easily corrected.

Some of the most common causes of breakage are listed below:

Turret Lathes

1. Running into work on rapid traverse.
2. Loose clutches.
3. Loose gibs.
4. Loose holders.

Milling Machines

1. Running into work or fixture on rapid traverse.
2. Fixture clamps loose.
3. Running cutter in reverse.

Loose and improperly maintained equipment can be very troublesome and many shops would do well in establishing a preventive maintenance program.

Examples of Real Savings Through Carbide

Not only have we found that cutting time can be considerably reduced, but there are many other savings that should

(Continued on page 122)

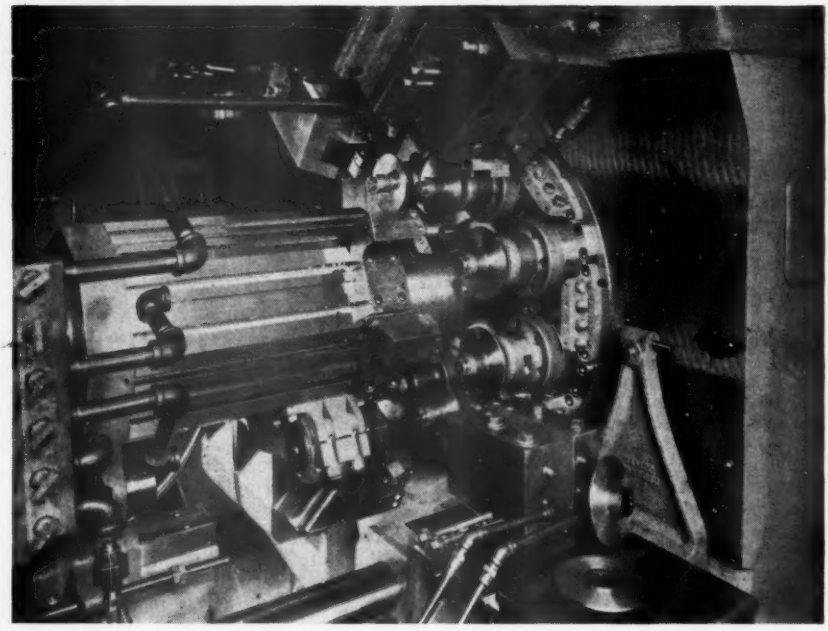
Sound Approach to Carbide Tooling on Multiple Spindle Automatics Helps to Insure Success

It is quite a sight to see a multiple spindle machine successfuly tooled with carbide. To see six or eight spindles, holding as many forgings or bars, indexing from station to station, each time producing a finished piece. To know that the same piece produced with high speed tooling would take two or three times as long on the same machine, and probably 10 to 20 times as long on a single spindle machine.

However, I'll guarantee that this successful tooling did not come about overnight or, for that matter, in days or weeks; but rather in months. And I would be willing to bet that along the line somewhere there was pressure to give the whole thing up because of the time and expense involved.

Most of us connected with this type of tooling have had to learn the hard way that there is no fast and easy way to successfully tool a multiple spindle machine with carbide.

This view from the rear of a mutiple spindle chucking machine shows the chip problem that must be met when tooling the machine with carbides. The proximity of the several spindles and tool holders multiplies the chip problem as compared to a single spindle machine. Note how, in conformance to the author's recommendations, the coolant is piped into the rear of the tool holders which are drilled so as to direct the flow right to the cutting edge. Other precautionary measures to prevent chip congestion are: when laying in the holders not to create pockets for chips to gather, and to try to have the heaviest machining performed in the lower positions directly above the chip pan, with the finishing cuts taken in the top positions.



by **Merrill Barden, Jr.**
Assistant to the Superintendent
The National Acme Company
Cleveland, Ohio

We have had to forget most of what we learned about high speed tooling and start all over again. As a matter of fact, I sometimes think the less you know about high speed tooling, the more easily you can adapt yourself to carbide tooling.

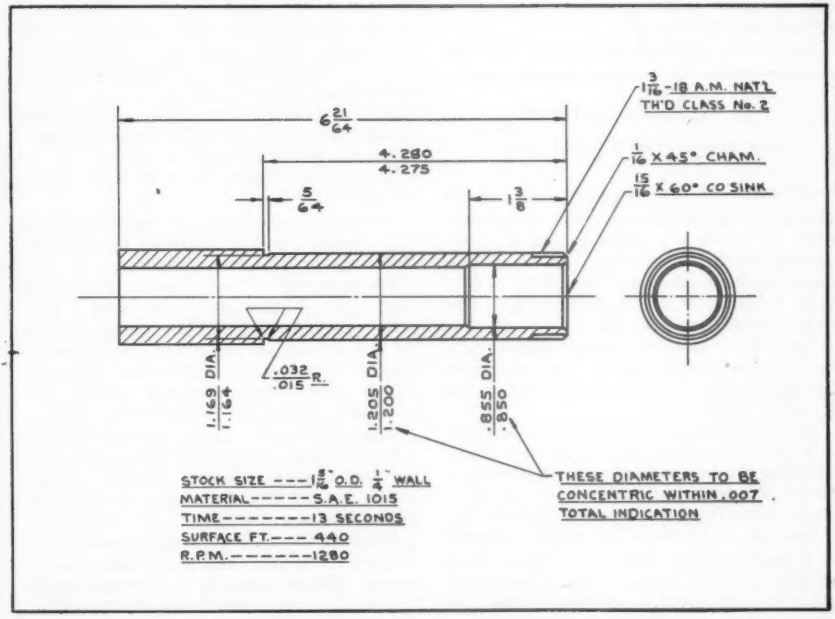
Those of us actually responsible for making chips and producing the pieces have had to convince engineering and designing departments to give us the horse power and beef in the machines and tool holders that we found had to be there before we could get anywhere. We have that now, along with very enlightened engineering departments who found that many dollars could be lost without the proper approach to the problems of carbide tooling.

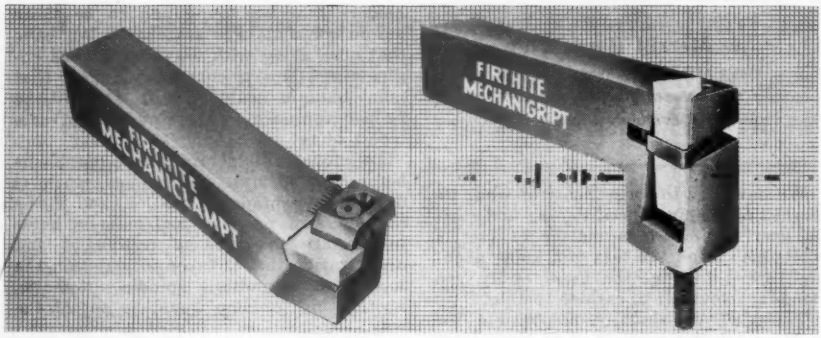
To know and understand those problems before you start to tool an automatic is a large percentage of the job, and if the customers of machine tool builders knew in advance the type of equipment and organization that it takes to maintain the tooling on a multiple spindle automatic, another big problem would be out of the way.

In the past, a demonstrator of an automatic tooled with carbide had to be an extraordinary fellow. He not only had to

(Continued on page 88)

Workpieces of such a design as this are most compatible to producing in automatic, multiple spindle bar machines. Being a tubular part precludes the problem of cutting-off clear to center. Here there is not a sufficient range of diameters to present a surface speed problem. If any wide form turning were involved, however, an attempt to employ a carbide form tool could well be unsuccessful. To use the desired feed for proper carbide cutting could stall the motor and at lessor feeds the tool wear would be excessive and expensive. In such cases, single-pointing the form would be much more satisfactory.





The Application of Mechnically Held Carbide Tools

by **M. L. Backstrom**

Firth Sterling Steel & Carbide Corp.
Pittsburgh, Pa.

Providing industry with a broader choice of standard cutting tool designs, Firth Sterling Steel and Carbide Corporation has recently added to the Mechanigript and standard brazed groups, a new series named Mechaniclampt.

It is not, however, the intent of this article to suggest that conventional brazed tools do not have a definite field of application, for such is not the case. However, many applications which have here-to-fore been impossible or impractical are now both possible and practical.

Featuring the use of standard rectangular Firthite inserts, many other desirable design features have been embodied in the Mechaniclampt tool.

A rugged clamping mechanism that permits adjustment of the tip in two directions facilitates a minimum of stock removal for regrinding. Made of an alloy steel, properly heat treated, failure due to fatigue or abrasion is greatly reduced.

A heat treated alloy steel body fitted with a specially treated steel insert provides a rigid and flat mating surface and reduces inventories of tool shanks.

Listed in Table I are the three types of tools available, general application and the advantages to be derived by the use of each of the three types. It is then up to the tool engineer and production man to decide which type will provide the highest performance and efficiency factors for a given set of conditions.

A judicious choice of the proper tool design may often result in improved performance factors of 300 to 400%.

A brief description of each of the three types is as follows:

Brazed: Tools fabricated by the joining of a carbide tip to a relatively inexpensive tool body by brazing or welding.

Mechanigript: Tools fabricated from a heat treated alloy steel body and a precision ground solid carbide insert. Design of the holder is such that interchangeability of inserts is facilitated with accurate relocation. Standard inserts are available. They are mechanically held.

Mechaniclampt: Tools fabricated from a heat treated alloy steel body and standard rectangular inserts. Design of the holder is such that maximum strength and durability are incorporated. Mechanical holding of the carbide insert is employed.

Quite naturally, maximum material removal is made possible by the use of the heaviest feeds which may be tolerated.

TABLE I

Brazed		Mechanigript		Mechaniclampt	
Application	**Advantages**	**Application**	**Advantages**	**Application**	**Advantages**
Applications where tool shank dimensions must be held to 1" sq. or less	Smaller shanks reduce steel and carbide requirements	High speed, light machining ferrous alloys	Minimum down time for tool changing. Minimum of adjustment required during operation	Heavy duty, slower speed machining of all materials. General shop equipment	Two way adjustment for minimum carbide removal per quantity of material machined.
			As high as 8 cutting edges made available per grind. Reduce grinding time and tool material consumed per quantity of material removed		
Cut off tools, form tools and others where tool design requirements do not facilitate mechanical holding	Smaller inserts may be used than can be accommodated in mechanically held tools	Repetitive operations in high production shops on automatic and semi-automatic machinery	Eliminates strains due to grinding	Machining of tough strain hardening materials such as armor plate, manganese steels and high temperature jet alloys	Reduces thermal strains caused by high temperatures generated in slow speed, heavy feed machining
			Eliminates strains caused by difference in thermal expansion resulting from heat generated in cutting and brazing process		Reduces thermal strains caused by grinding. Provides added strength in tool body to withstand heavy cutting forces
Occasional or non-repetitive work when large tool bodies are required	Operations that can not be performed with mechanical held tools may be done economically		Eliminates maintenance equipment for brazing and servicing of shanks		
			Reduces inventories of tool and shank materials		Tool bodies are non-expendable. Permits the use of harder and more wear resistant grades of carbide
Machining of highly ductile materials requiring positive rakes and greater clearances			Permits the use of harder and more wear resistant grades of carbide		
			Tool bodies are non-expendable		Uses standard stocked rectangular blanks

Machine horsepower, surface finish requirements, material being machined, the geometry of the part being produced and the amount of metal removal will all influence the design of the tool.

One of the main requirements of any cutting tool is its ability to withstand elevated temperatures. The amount of heat generated in any cutting operation is directly proportional to the amount of work done. The heat developed may result from abrasion, shearing and deforming of the chip as it is removed or a combination of these factors. Mechanical holding of the carbide sections, in many cases, will materially increase their ability to withstand the degenerative effects resulting from these conditions.

Tungsten carbide, an extremely dense and hard material, is inherently weak in tension. The method of fabricating a cutting tool may result in a reduction of the available strength in a finished tool to withstand the effects of vibration, shear, tension and compression in the cutting process. This is particularly true of tools requiring heavy bodys and large inserts.

Grinding and brazing may quite often result in the creation of stresses great enough to result in cracking or breaking before the tool is actually used for material removal. The difference in thermal expansion of carbide and steel promotes failure of this type.

Cutting temperature as measured at the tool interface may reach 1400° F. Temperatures of this magnitude will result in an average expansion of tungsten carbide of 0.005 inches per inch. Unless the carbide is allowed to "breathe", with varying temperatures, thermal cracking will result. The elimination of molecular bonding by brazing or welding provides the required freedom.

Present machining requirements and the materials to be machined necessitate a careful investigation by tool engineers to determine the type of tooling which best suits a particular application.

Typical of the alloys requiring special attention are armor plate, high temperature jet materials, and manganese steels. All of these materials in the fully annealed condition are relatively soft and ductile. However, they are very readily subject to cold working and strain hardening. Were it not for the use of carbide and mechanically held tooling, many of these alloys would be classed as unmachinable.

Armor plate, for example, that may be machined with high speed steel at 30 surface feet per minute is readily machined with mechanically held carbide tools at 120 feet per minute.

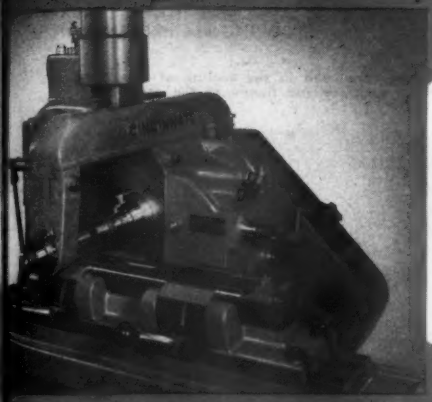
Machining of jet aircraft materials such as extremely high strength stainless steels, Inconel and Nimonics, require the use of heavy feeds and slow speeds. The ability of mechanically held tools to withstand shock, both thermal and physical, make their use mandatory when possible.

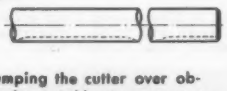
A typical application of mechanically held tooling resulting in outstanding performance may be tabulated as follows:

Operation	Tool Design	Feeds & Speeds	Production
Turning work-hardened manganese steel	High Speed Steel	25 surface feet per minute ¼" feed/rev.	4 parts per 8 hour day
	Carbide-brazed design	Impossible	None
	Carbide mechanically held	150 surface feet per minute .045" feed/rev.	16 parts per 8 hour day

An increase in production of 300% is obvious. The elimination of brazing equipment, more efficient grinding (no compromise in the selection of a grinding wheel) and decreased tool fatality, results in even greater efficiency.

It behooves all tool engineers and production men in the interest of increased economy and efficiency to consider the application of mechanically held tooling whenever possible.





Jumping the cutter over obstacles or taking two or more aligned cuts are specialties of CINCINNATI No. 0-8 Rise and Fall Automatics. In this example two keyways are milled in one cycle. Production . . . 101 per hour.

CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machine. Catalog No. M-1607-1.

Relief for Shops . . .

CINCINNATI

ABOUT TO BURST THEIR PRODUCTION SEAMS

If you're concerned with milling operations on large quantities of small parts, you can produce them faster and at lower cost on CINCINNATI No. 0-8 Milling Machines. And you may probably gain an extra advantage of smaller floor space—the 0-8's require very little, and they can readily be integrated with conveyors. ¶ You have a choice of four CINCINNATI No. 0-8 Milling Machines:

1) No. 0-8 Plain Automatic
2) No. 0-8 Automatic Rise and Fall
3) No. 0-8 Vertical, longitudinal table feed
4) No. 0-8 Vertical, rotary table feed

A few examples of the type of work handled by these efficient, hard-working machines are illustrated here. Do they give you ideas? Complete data about CINCINNATI No. 0-8 Millers may be obtained by writing for the literature indicated in the captions.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

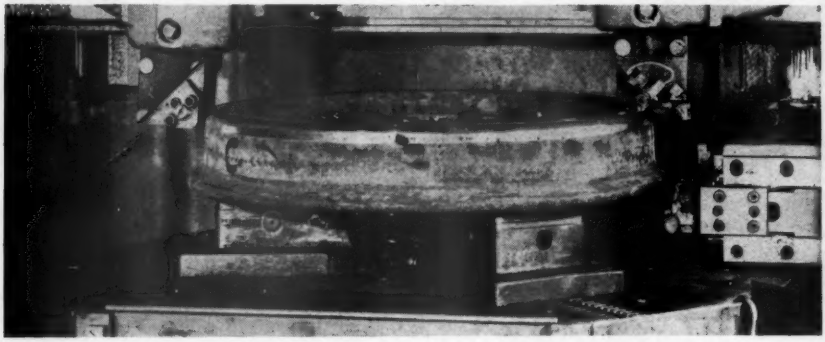
A high speed carbide milling operation on a CINCINNATI No. 0-8 Vertical, milling the bottom of an aluminum brake shoe support. Production . . . 120 per hour.

CINCINNATI No. 0-8 Vertical with conventional table feed. Catalog No. M-1532-2.

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
VERTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Fig. 1. Round inserts of Kennametal K4H ground cylinders are used in the tooling of this Bullard vertical lathe. Both rough and finish contouring of the tread, face and flange of the car wheel are performed in six minutes, floor to floor time.



Trends in Carbide Tooling

Carbide cutting tools for machining operations came into prominence about 15 years ago, just a few years before the start of the war. During these 15 years many significant developments in the application of carbides have occurred. A look at a few typical carbide applications

by **Bennett Burgoon, Jr.**
Kennametal Inc.
Latrobe, Pa.

operating today will reveal the extent of the progress that has been made.

First, let us consider the machining of rolled steel railway car wheels. The tread and flange were formerly form cut with high speed form tools at about 40 surface feet per minute. It took one-half hour to finish a wheel after first roughing out with high speed steel turning tools. Figure 1 is typical of the way the job is tooled today. Floor to floor time per wheel is six minutes. The round inserts you see in the tool posts on the Bullard vertical turret lathe are Kennametal K4H ground cylinders, of 1¼" diameter and 2½" long.

These cylinders, tilted 7° for clearance, do both heavy roughing and finish contouring of the tread, face and flange. They are activated by a contouring device in conjunction with the Bullard Man-Au-Trol positioning table. K4H is a hard finishing grade originally used only for light finish cuts. In this operation the feed rate is .041" per minute. The cylinder is indexed when dull without disturbing the tool setup. After six indexes on each end, a total of 12, the insert is removed for regrinding.

Contrast this tool with the small braze-tipped tool formerly used. The brazed tool was an inherently weak design. The steel shank, softened by the brazing heat, had a modulus of elasticity of less than one-half that of the carbide tip. In other words, under a load as encountered in heavy machining, the steel shank being more than twice as flexible as the carbide tip offered little support even when overhang was held to a minimum.

In addition to this limitation, the tip

(Continued on page 114)

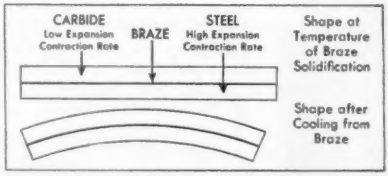
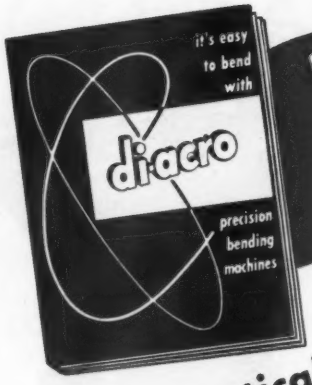


Fig. 2. A graphic illustration of the shape of a brazed carbide tool at the brazing temperature and after cooling.



"it's easy to bend"

a new practical 32 Page diacro

BENDING MANUAL

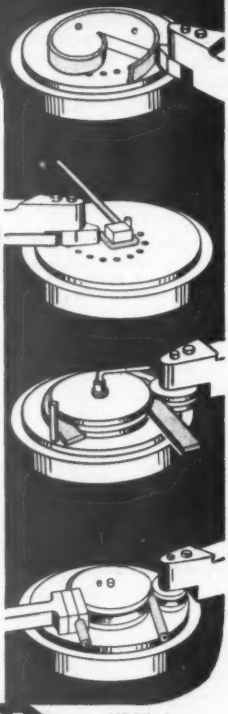
by the originators of "Die-less Duplicating"

This instructive and authoritative booklet will quickly prove itself indispensable wherever bending is done or is needed. It brings you a veritable gold mine of tested, authentic bending methods applicable to any rotary type bender. The proper bending technique may frequently offer a new approach to an old problem by simplifying product design and cutting production costs.

The exact methods of producing various types of bends in a wide range of materials are illustrated, step by step, with over 90 diagrams and charts together with valuable tooling suggestions.

You'll want a copy . . .

Mail your request today.



DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN

315 8th Ave.
Lake City, Minn.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Fundamentals of Carbide Tool Grinding

Sintered carbide, which today is widely used by industry for single point tools, differs radically from high speed steel tools and, therefore, requires very different grinding methods and equipment. Being much harder, it is more difficult to grind, but this difficulty is greatly overshadowed by its increased tool life, improved performance and increased production. Past experience, often gained through costly trial and error grinding methods, has established some basic information which may be helpful, both as a refresher to those now using carbide and as a guide for new grinding room personnel.

by **Ramsay M. Bell**
Technical Manager
Hammond Machinery Builders, Inc.
Kalamazoo, Michigan

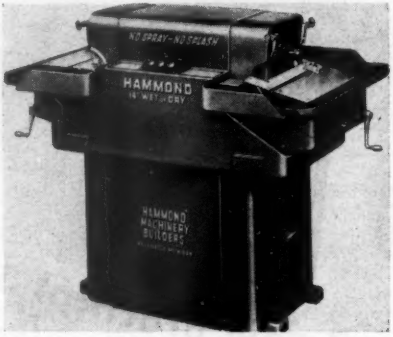
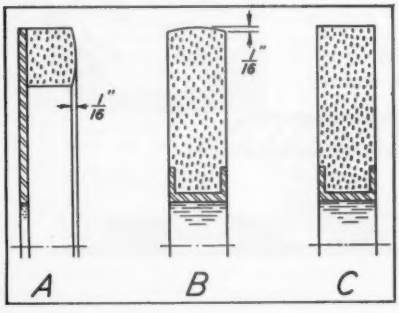


Fig. 2. Hammond Model 14-WD wet or dry carbide tool grinder having two 14" diameter cup wheels. This type should be used when grinding tools with shanks over 1" sq. or when grinding large quantities of ¾" to 1" shank sizes.

Use the Right Wheel

In grinding single point tools it is usually best to perform both a roughing and a finishing operation on the carbide tip. These operations may be done with either silicon carbide or diamond wheels.

Fig. 1 shows cup wheel (A) and straight wheel (B) dressed to 1/16" crown, and straight wheel (C) dressed with flat surface.



Silicon carbide wheels should be of an open, porous construction, which will break down readily, insuring a cool cutting, sharp wheel. They should be faced true frequently with a diamond dresser and then dressed to a $\frac{1}{16}$" crown with a star dresser as illustrated in Figure 1. Roughing is usually done with 60 to 80 grit, and finishing with 100 to 120 grit.

If diamond wheels are used, they may be either resinoid or metal bonded, and should be used with either a drip or flood of coolant. The first cuts more freely and cooler, but must be handled more carefully to avoid damage. Metal bonded diamond wheels are best used with a flood of coolant on a machine of the type illustrated in Figure 6. If handled properly, diamond wheels will require very infrequent dressing. 100 to 120 grit cuts readily for roughing while 220 to 240 grit is used for finishing.

Most common practice is a combination of the above wheels, using a silicon carbide wheel for roughing and a diamond wheel for finishing; however, it may well be practiced to advantage today to use

(Continued on page 78)

Cylinders

USE

Palmer-Shile AIR SAVER *Leak Proof* AIR VALVE

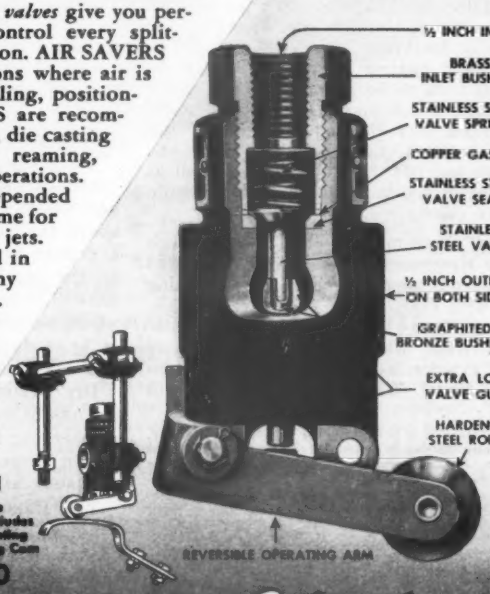
TO *Get Split-second Air Control!*

FOR MAXIMUM MACHINE TOOL EFFICIENCY

PALMER-SHILE *Air Saver air valves* give you perfect, leak-proof air power control every split-second of machine tool operation. AIR SAVERS are ideally suited to applications where air is used for cleaning, drying, cooling, positioning or ejecting. AIR SAVERS are recommended around punch presses, die casting machinery, drill presses, in reaming, broaching and many other operations. AIR SAVERS may always be depended upon to provide ample air volume for operation of single or multiple jets. AIR SAVERS may be mounted in any position, to operate at any angle unaffected by vibration. MANUFACTURERS AND OPERATORS: for split-second air control and maximum machine tool efficiency, build Air Saver air valves into your new machines. Or install Air Savers in machines you now have in operation.

Immediate Delivery

50975
(Valve Alone)
$13.20



50801
Complete Assembly Includes Valve, Mounting Rods, Operating Cam
$16.50

Palmer-Shile Co.

16039 FULLERTON AVE. • DETROIT 27, MICH.

. . . Carbide Tool Grinding, from page 76

silicon carbide for both operations by those who have found it difficult to obtain diamond wheels.

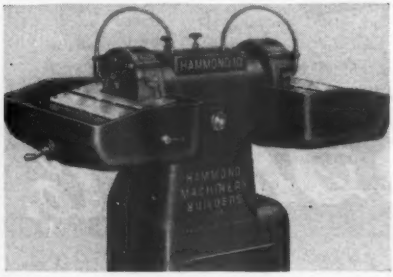
Grinding of the steel shank of single point tools should be done on aluminum oxide straight wheels because silicon carbide or diamond wheels will soon become loaded with steel particles if any attempt is made to grind both shank and carbide tip at the same time. The working face of the wheel may be either straight or crowned for shank grinding as shown in Figure 1.

Grinder Selection

Of great importance is the selection of the correct type and size of grinding equipment. Too often the question is raised too late, that the grinder selected is too small or too light and does not have desirable features. The grinder should be heavy and rugged enough to handle the largest tools to be ground without undue vibration, which may easily cause inaccurate work and checked or cracked tips, which in turn raise grinding costs and shorten tool life. The quantity, as well as the size of the tools to be ground, should also be considered.

A 14" diameter cup wheel grinder, such as the Hammond Model 14-WD illustrated in Figure 2, should be used when grinding tools with shanks over 1" square or when grinding large quantities of ¾" to 1" shank sizes, while a 10" diameter cup wheel grinder, as illustrated by the Hammond Model WD-10 in Figure 3, will usually suffice for shank sizes up to 1" square or large quantities of smaller tools.

Fig. 3. Here is a 10" diameter cup wheel grinder, Hammond Model WD-10 wet or dry carbide tool grinder, for shank sizes up to 1" sq. or large quantities of smaller tools.



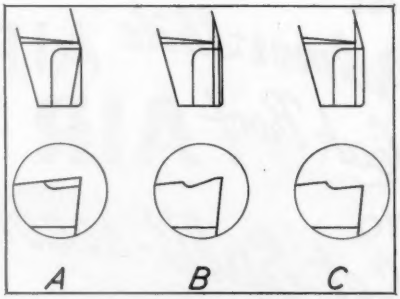


Fig. 4 shows three types of "ground in" chip breaker grooves: (A) angular; (B) groove; and (C) parallel.

Wet or Dry Grinding

To grind wet or dry is a very highly discussed subject and both methods have their merits and disadvantages. Either method is permissible as long as the following rules are strictly observed.

Wet Grinding. If grinding wet with silicon carbide wheels, use a flood of coolant directed immediately at or slightly above the point of grinding. Never use a drizzle or intermittent flow of coolant as the carbide will check and crack if allowed to heat and cool rapidly. Diamond wheels may be used with a flood of coolant or by a drip or wick saturated with oil to prevent loading.

Dry Grinding. If grinding dry *do not use any coolant.* Care should be taken not to overheat the tool, and the carbide tip should never be dipped in a coolant immediately after grinding.

The Hammond grinders illustrated in Figures 2 and 3 may be used either wet or dry as desired.

Chip Breaker and Insert Grinding

Machining steel at high speeds usually results in a continuous chip that is hazardous to the operator as well as difficult to handle. Three types of "ground in" chip breakers, Figure 4, are generally used. The feed determines the depth while

(Continued on page 182)

WESSON METAL IS PRODUCING

MANY MORE "CONTROLLED" LOTS OF WESSONMETAL

TO MEET THE EVER INCREASING DEMAND FOR THIS IMPROVED CARBIDE!

WESSONMETAL

★ Solid Carbide Blades
★ Standard and Special Carbide Tips
★ Solid Carbide Shapes

6 STANDARD GRADES . . . 2 SPECIAL GRADES TO MEET HIGH SPEED AND HIGH FEED RATES OF MODERN MACHINE TOOLS

Uniform dependability is maintained in Wessonmetal because it is quality controlled by Wesson's exclusive method of small lot production. Each lot is carefully processed—rigidly inspected to maintain uniformity—highest possible quality. Whatever your needs in Solid Carbide—you can depend on Wessonmetal for Quality, Economy and Efficiency.

Write for Bulletin

WESSON METAL CORPORATION
Lexington, Kentucky
Affiliated with WESSON COMPANY

PIONEERS IN THE ART OF DESIGNING AND PRODUCING CARBIDE TOOLS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Machining Titanium Alloys

Editor's Note: We present this article on machining titanium alloys because it gives a good picture of the present status of titanium and because of the titanium machining characteristics it discloses. Tests discussed include both HSS and Carbides. The article is reproduced from the Air Force Curtiss-Wright Machinability Report, Vol. II, Section 5. This covers the Machinability Research Program sponsored by U. S. Air Force, Resources Planning Section, Industrial Planning Division, Air Materiel Command. This important work, Volumes I and II, has been published and made available to industry by Curtiss-Wright Corporation to whom we are indebted for permission to reproduce. E.W.P.

Titanium Technology Is Growing Rapidly

Data presented in this preliminary report are tentative; titanium alloys are only beginning to be used to any commercial extent. New alloy compositions are coming along; new methods of producing titanium are being perfected; quantity produced is growing and the price will doubtless drop.

While glowing predictions are dangerous, it looks as though titanium alloys may cut heavily into fields now dominated by aluminum, alloy steel and stainless steel. Any new material requires a tremendous amount of development work and actual shop experience. The present status of titanium might be likened to that of aluminum in its early days. It will probably take some time before the picture becomes reasonably stabilized as more and more of the potentialities are investigated.

What Is Titanium?

Titanium is a silvery-gray metal weighing about half as much as steel, or about one and a half times as much as aluminum. Two of its most important properties are its extremely high strength-weight (in the alloy form), exceeding all usual materials; and its generally excellent corrosion resistance. Titanium alloys, unlike most other light metals, retain their strength at temperatures up to about 800° F. Endurance limit and fatigue characteristics appear to be excellent.

Pure titanium is comparatively soft and weak (and also extremely difficult to refine). Commercially-pure titanium contains enough impurities to alloy the material considerably with an attendant improvement in mechanical properties. Metallurgists have been trying various alloy combinations to develop high-strength materials. The ones currently in use contain chromium and iron, or chromium and aluminum, manganese and aluminum, or manganese alone.

Titanium Machines Like Jet-Engine Alloys

Titanium's properties are of tremendous importance to the aircraft industry (high strength, light weight, high endurance limit, corrosion and heat resistance), and most of its experimental applications are in this field. Among the metals extensively used in the aircraft industry, the austenitic stainless steels come the closest to titanium in giving an approximate concept of how the new material can be expected to machine.

Reports from several of the aircraft builders give this impression. Tests conducted in the manner described in Section One and in the 1950 Report show that titanium is considerably more difficult to machine than stainless steel, and that it would better be classified in the range with the less familiar high-temperature, jet-engine alloys. In fact, comparing titanium with stainless steel is justifiable only in that both alloys are highly work-hardenable and cut with a tough, stringy chip. To this extent, the comparison serves as a starting point for new users of titanium alloys.

Turning

High speed steel tools having the same angles as used in the steel tests of Section Two (0 BR, 15 SR, 0 SCEA, 5 ECEA,

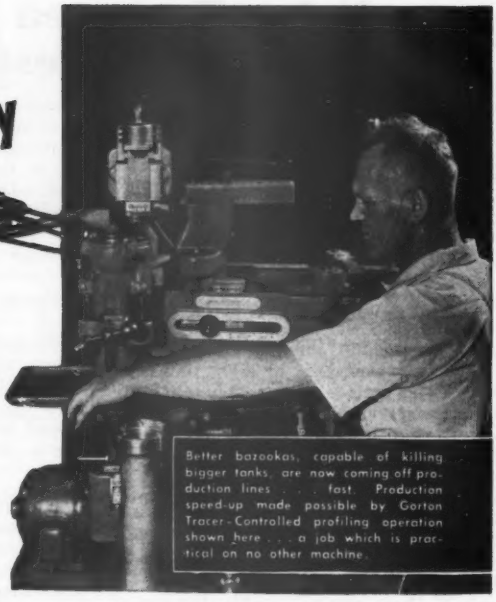
(Continued on page 112)

Duplicators

Pantography at Work

★

Inside profiling operation produces more than 36 pieces per hour with Gorton Tracer Control. Approximate time by the next best method . . . one piece every two hours.



Better bazookas, capable of killing bigger tanks, are now coming off production lines . . . fast. Production speed-up made possible by Gorton Tracer-Controlled profiling operation shown here . . . a job which is practical on no other machine.

GORTON

• IMPROVES QUALITY • INCREASES PRODUCTION • CUTS COSTS

On many all-but-impossible jobs, Gorton Tracer-Controlled Pantographs and Duplicators speed up production on military or industrial contracts. High surface finish results from spindle speeds up to 45,000 R.P.M. Accuracy results from the use of over-size masters, patterns, or templates together with the reduction ratio which is exclusively characteristic of the pantograph. Whether a dozen or a thousand pieces, each is identical to the first. Work piece size varies from instrument parts to areas of 10 to 20 feet.

Gorton tracer-controlled equipment quickly pays for itself in profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving as well as many other standard or special operations on ferrous or non-ferrous metals and plastics where work is flat, uniformly curved, cylindrical, spherical or irregular in shape.

Mail the coupon below for General Catalog illustrating the complete Gorton line.

PRODUCTION DATA—

JOB: Profile 6 locking lugs for male and female sections of new 3.5" Bazooka

MATERIAL: Aluminum alloy

CUTTER: 5/32" dia. single flute, fast spiral H.S. steel running at 3,900 R.P.M., without coolant

MASTER: 2 masters: one for male and one for female sections; 3 times oversize, traced manually

HOLDING FIXTURE: Pneumatic-operated internal expanding type

APPROX. TIME: 36 pieces per hour

ALTERNATE METHODS: None practical

GEORGE GORTON MACHINE CO.

1202 Racine St., Racine, Wis., U.S.A.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1202.

Firm .....

Name .....

Title .....

Address .....

City, State .....

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Using Tungsten Carbide for Wear Resistance

Feed Nozzles for Arc Welders "Wear Proofed" with Carbides

By adding a Carboloy cemented carbide bushing, Figure 1, inside the conventional feed nozzle tip for automatic arc welding, the General Electric Company at its Fort Wayne Works has increased life of the nozzle tips up to 20 times. Wear is no longer a problem, and burning effect is greatly reduced.

In one case where the coiled electrode wire is especially abrasive, brass nozzles had to be replaced six or eight times per week. The carbide protected nozzles are giving a service life of three months and better. On other operations where former life had not exceeded three weeks, the carbide nozzles are lasting as long as 12 months. In addition to the improved nozzle life, a more uniform narrow weld can now be maintained, as accurate guidance of the wire—formerly difficult once wear developed—is no longer a problem. In view of these several benefits, the use of carbide-equipped nozzle tips has been made standard on about 20 automatic arc welding machines.

Improvements have been made with Carboloy cemented carbide at two other points in order to further reduce downtime and maintenance cost on arc welding equipment. A carbide guide ring—added inside the fibre guide which keeps the electrode wire from riding off the overhead pulley—eliminates any possible danger of short-circuits from wire wearing through the fibre insulation and coming into contact with the metal support arm.

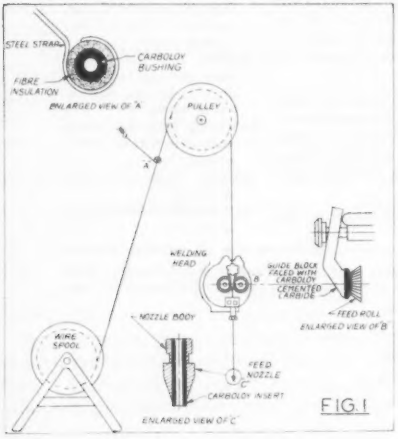


FIG. 1

The final application was at the guide block which locks the electrode wire in position against the conical feed rolls. When wear occurred at this point, positive feeding was impaired. To eliminate this condition, the guide block is now tipped with a standard Carboloy carbide blank. The face of the blank is ground to provide a slight radius.

"Wear Proofing" Clutch Plates

Another use of tungsten carbide for "wear proofing" purposes is being made at the Fort Wayne, Indiana, plant of General Electric Co. There, floating plates of machine clutches, formerly scrapped when the guide tangs developed wear (approx. 9 to 12 months), are now not only being salvaged but actually so improved in the salvaging operation as to give them many times their original life.

Four tangs guide the clutch plate in internal keyways on the drum and cause the plate to revolve with the driven drum. Because of the slight clearance between revolving plates and stationary parts, they are repeatedly and rapidly brought together by vibration of the machine. At each moment of contact, friction on the face of the clutch plate seeks to stop it from turning; as opposed to the plate's rotation enforced by the driven drum. The continued pounding on the original tangs eventually caused them to wear and loosen up in the keyways. The impact loading which then developed accelerated the rate of wear even more.

The simple expedient, which also resulted in eliminating costly and lengthy machine downtime for clutch replacement, was to machine off the four worn tangs,

(Continued on page 108)

How All Three Speed Steels Make Plastic Pipe More "Flexible"

Carlon is a plastic pipe used to transmit fluids and vapors over irregular surfaces. This Speed Steel Mold—using Holliday's Speed Case (X1515), Speed Treat (X1545) and Speed Alloy hot rolled alloy plate steel helps make Carlon even more "flexible". It molds 6" dia. threaded plastic couplings that join either long lengths of Carlon to Carlon or Carlon to standard metal pipe.

Naturally, these couplings have to be near-perfect to prevent leakage. Carlon Products Corp. reports top distortion-free production at the rate of one shot per minute. Houk Machine Company, Barberton, Ohio who made the mold of Speed Steels for Carlon, reports 40% faster machining than regular hot rolled carbon or tool steels plus an absence of warpage and distortion and longer tool life. Top and bottom plates are of ground Speed Treat plate, male and female core are of Speed Case carburized to Rockwell 55 "C" then ground to size. Other parts are of Speed Alloy.

How versatile Speed Steels are solving new fabricating problems every day makes mighty profitable listening. Check with your Speed Steel distributor or write direct for literature.

SPEED STEELS

SPEED ALLOY ■ SPEED CASE ■ SPEED TREAT

DISTRIBUTED BY

Brown-Wales Co., Boston-Hartford-Lewiston, Me. ■ Bridgeport Steel Co., Bridgeport, Conn. Beals, McCarthy & Rogers, Buffalo, N. Y. ■ Burger Iron Co., Akron, Ohio ■ Grammer, Dempsey & Hudson, Inc., Newark, N. J. ■ Earle M. Jorgensen Co., Los Angeles-Houston-Oakland-Dallas ■ Passaic County Steel Service, Inc., Paterson, N. J. ■ Peckover's Ltd., Halifax-Montreal-Toronto-Winnipeg-Vancouver ■ Peninsular Steel Co., Detroit, Mich. Pidgeon-Thomas Iron Co., Memphis, Tenn. ■ Horace T. Potts Co., Philadelphia-Baltimore

Produced by W. J. Holliday & Co., Inc., Speed Steel Plate Division, Hammond, Indiana. Plants: Hammond and Indianapolis, Indiana

Steel

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Work Handling at the Press (continued)

Use of Coiled Strip on Increase

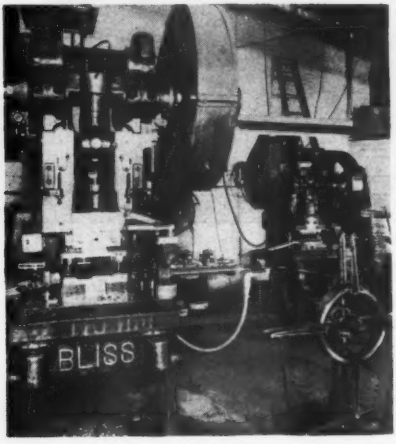
Cases are continually on the increase where coiled strip is fed to presses. In most instances, some type of roll feed is used for feeding coiled material to a press. A number of firms have developed very fine roll feeds for this purpose. In addition to the feed itself, auxiliary equipment is needed, in the form of a suitable centering reel for holding and revolving the coil of material being fed. Experience has shown that in practically all cases it is best to remove coil curvature from stock before it enters press dies, since removal of coil curvature allows the material to pass much more freely through progressive and compound dies. Also, it eliminates apparent inaccuracy resulting from curved stock.

Removal of coil curvature from material involves employing some type of straightening device, between the reel which holds the coil and the dies. Firms specializing in provision of automatic feeds for coiled stock also furnish the necessary auxiliaries. Units suitable for use in connection with practically any press may be obtained. Actual feeding rolls used have different types of finishes on their surface, depending upon material being fed.

If highly-finished stock is being processed, feed rolls are hardened and ground perfectly smooth, or at least this is true of infeed rolls. Out-going feed rolls, and rolls used where stock is not polished, are often sand blasted on their surfaces, after having been hardened and ground. Where very slight marking of stock is not objectionable, feed rolls may be hob-milled, hardened, and ground. Such rolls have materially increased pulling power, and also have a decided tendency to spread lubricant evenly over material being processed.

by **John E. Hyler**

This 3-inch Dickerman feed, mounted on the press bolster plate, is feeding stock of .020" thick to a 10-station progressive die, without pilots. Both a drawn part and a blank are produced, side by side, from the stock. Automatic feeding increased production 40%, and its accuracy, compared to hand feeding, decreased down time.



Types of Roll Feeds

Some roll feeds for coiled stock are of rack-and pinion type, the rack receiving actuation from a driving disc of two-piece construction, which is mounted on the press crankshaft. This arrangement provides a means of changing the timing of the feed with regard to the press slide.

Several other feeding devices have been developed for use in feeding coiled stock to and through presses. All of them necessarily incorporate some well developed means for advancing the metal strip precisely the amount desired, holding it firmly during operation of one punching cycle, then advancing it again. One very fine arrangement found in some double-roll feeds for punch presses makes use of two special indexing clutches. As the strip is passed through the feed rollers, the special clutch advances the strip to the desired point, automatically indexing so work advance is held to close tolerances, even at a high rate of feed. A second clutch is incorporated, which prevents back feed between forward strokes.

Different types of feeds for punch

BAUMBACH DIE SETS

Coast to Coast

See us at Booth No. 1714
ASTE Industrial Exposition
International Amphitheatre
Chicago, Mar. 17-21, 1952

CALL DEALER NEAREST YOU...

CLEVELAND, OHIO
Cutting Tools, Inc.
16809 Euclid Ave.
Telephone IVanhoe 1-3737

DALLAS, TEXAS
Bill Lindsley Machinery Co.
2001 Elm St.
Telephone Prospect 1621

DAYTON, OHIO
E. C. Hawk Co.
600 Wayne Ave.
Telephone Fulton 8132

DENVER, COLO.
Tobacraft Service Co.
108 Colorado Bldg.
Telephone Alpine 4837

DES MOINES, IOWA
Iowa Machinery & Supply Co.
1512 East Army Post Rd.
Telephone Polk Hillcrest 61-1512

EAST ST. LOUIS, ILL.
Machine Machinery & Die Works
1201 Piggott Ave.
Telephone Bridge 8012

ELKHART, IND.
Tobacraft Machinery & Supply, Inc.
220 W. Bristol St., Box 13
Telephone 3-3210

GRAND RAPIDS, MICH.
Manufacturers Supply Co.
28 Commerce Ave., S. W.

INDIANAPOLIS, IND.
Indiana Manufacturers Supply Co.
937 Fort Wayne Ave.
Telephone Riley 2431

KANSAS CITY, MO.
Ernest Machinery Co.
5501½ Troost Ave.
Telephone Jackson 8070

LOS ANGELES, CALIF.
Peck Steel & Die Supply
4420 Long Beach Ave.
Telephone CEntury 2-3292

MILWAUKEE, WIS.
F. W. Gross Machine Co.
1760 W. Hooker Ave.
Telephone Fitzroy 4-1160

MONTREAL, QUEBEC, CANADA
C. H. Smith & Co.
647 St. Maurice St.
Telephone Uptown 4822

NEW BRITAIN, CONN.
Industrial Booth & Equipment Mfg.
89 South St.
Telephone 3-4726

NEWARK, NEW JERSEY
Kelly Machine & Company
32 Filmore Place
Telephone Mitchell 3-6430

PHILADELPHIA, PENNA.
Machine Machinery Company
810 Bourse Building

ROCKFORD, ILL.
Rockford Industrial Steel Service
710 Mercer St.
Telephone 2-6826

ST. PAUL, MINN.
Sales Service Machine Tool Co.
2265 University Ave.
Telephone Nestor 8-0

SEATTLE, WASH.
National Steel Sales Co.
1931 1st Ave. South
Telephone Mutual 2650

SYRACUSE, NEW YORK
Steel Plate Supply Co.
415 So. Clinton St.
Telephone 2-2181

TOLEDO, OHIO
Mega Industrial Equip.
4041 South Ave.
Telephone Lawndale 3-1112

TORONTO, ONTARIO, CANADA
Mechanical Handling
777 Queen St. West

E. A. BAUMBACH MFG. CO.
1816 S. KILBOURN AVENUE • CHICAGO 23, ILLINOIS

A printing type of counter in use on a Niagara press. It prints the production counts on time cards, route cards, or other standard cards such as IBM, Remington Rand or McBee. This printed record system allows the operator to turn in his own count of production in legible form, which is positive verification of the actual pieces produced by the press.

presses feeding coiled material are actuated from the machine crankshaft. In one line of roll feeds, power for actuation is transmitted by chain, from a sprocket mounted on the press crankshaft to a sprocket mounted on the drive shaft of the feed. An adjustable chain tightener is incorporated, which takes up slack in the chain, and therefore permits use of interchangeable sprockets for any desired ratio between press action and feed.

Single and Double Roll Feeds Employed

Both single-roll and double-roll models are available which are driven in this manner. Their design is such that they may be mounted on a press in any position; right, left, front or back. Facilities are provided for easily reversing direction of feed. The arrangement is such that the feed rollers revolve continually, and are lifted from the stock as necessary to stop feeding. Therefore, length of feed per stroke is dependent on the number of revolutions the feed roller turns for each stroke of the press. This is easily determined and governed by the sprocket ratio employed.

Some very fine roll feeds are operated by an eccentric mounted on the crankshaft of the press. Length of feed on these units may be readily adjusted, by means of an adjusting screw on the driving eccentric.

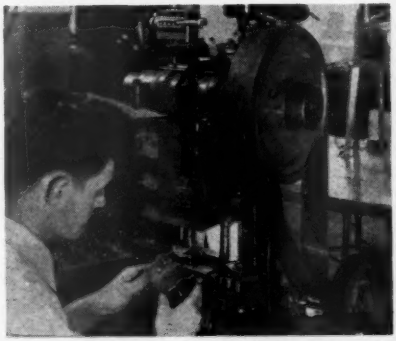
Another interesting feed for coiled stock, actuated by means of an eccentric mounted on the crankshaft extension, is one incorporating a feed block. This block is actuated between positive stops. The stops limit the motion of the feed block to the desired length of feed at each stroke. Normally, these feeds advance material from left to right. In cases where it may be desirable, however, such a feed may be especially arranged for feeding right to left, front to back, or back to front.

Block Rides on Hardened Rods

The feed block, reciprocating between the stops as mentioned, is actuated on hardened slide rods. Mounted in the feed block is a Stellite-tipped feed blade. The blade is arranged in such manner that it first clamps the stock on the forward stroke. Then the feed block moves forward the desired length, moving the stock with it. On the return stroke, the pivotal mounting of the feed blade enables the feed block to be returned without moving the stock. A drag or roller check is provided. This check positively insures that stock will not be moved backward on the return stroke. This is a highly accurate method of feed.

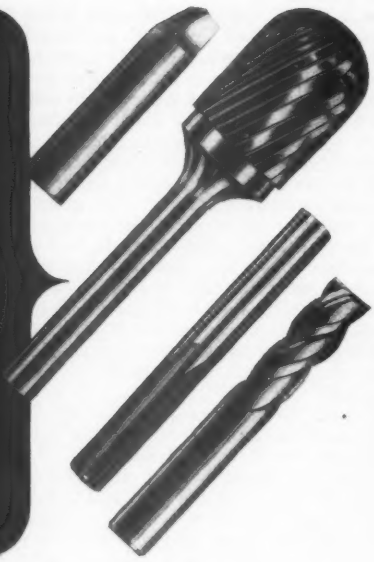
Some types of punch-press or die feeds are designed in such manner that they have no connection to the crankshaft of the press. As a result, they may be installed at will on any idle punch press. There are various cases where this is

(Continued on page 154)



At the top of the photo may be seen an automatic stroke counter as installed on a small press.

They're TUNGSTEN CARBIDE



They're PRECISION GROUND-FROM-THE-SOLID Carbide

Quality Engineered

BURS, REAMERS, END MILLS
BORING BITS & TOOLS
AND OTHERS BY ATRAX

THE **ATRAX** COMPANY

NEWINGTON IN CONNECTICUT

Write for our complete catalog *NOW!*

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Automatics, from page 69

know carbide tooling but he had to be a super diplomat as well. He had to gently break it to the customer that good grinding equipment would have to be purchased. He had to teach proper carbide grinding procedures, generally to an excellent tool room grinder hand who resented an outsider telling him anything about grinding, even if he hadn't ever ground carbide.

While doing all this, he would have to bring up the subject of extra tooling, because without plenty of extra tools around while working out the "bugs" in a job you are lost. And, hardest of all, he had to convince the works manager and the production manager that it would take a lot of time and money to do the job right.

Today, most companies are up to date and have good grinding equipment and are aware of the trouble and expense that go along with this tooling.

However, they are also aware of the tremendous savings in man hours and floor space per piece produced.

In a recent installation in the Detroit area, while it took over a year and a half to get from drawing board to predicted production, five automatics took the place of about 40 machine tools and as many men.

I would not like to have it construed by this article that bar machines are as adaptable to carbide as chucking machines. While most of what I have to say applies to both types of machines, the tooling of bar machines presents many problems not present with chucking machines, and I will discuss them separately in later paragraphs.

Probably the greatest single determining factor in the success of tooling automatics is how fast the tools can be changed.

Let us consider this in the light of an actual case history, where 20 carbide tools were used, and the machine cycled in 20 seconds. We had to settle for an average of 500 pieces per grind, which was fairly good when you consider that it was equal to about 12 hours run with high speed tools. So, to attain approximately 70% of gross production, there had to be about 40 tool changes in an eight-hour day. This gave about 3.6 minutes for each tool change if they never missed a beat for anything else. Actually the tools had to be changed within an average of two minutes each. The tool holders had to be revamped and elaborate tool setting gages were made. Many of the tools were redesigned so they could be put into magazine clips and preset in the tool room. The screws for adjusting and holding the tools were changed so they would all be alike, thus enabling the operator or setup man to carry only one wrench.

This job was not an exception, but typical example of high speed production carbide tooling. It does not necessarily follow that if you make pieces faster with carbide you are going to get more pieces per grind. You do well to equal the life of high speed, so if you make twice as many pieces in eight hours you are going to change twice as many tools.

The number of tools will vary according to the job, but in most cases it will range from 16 to 24 on six and eight spindle machines.

I hope that someday multiple spindle machine tool builders will develop a machine on which you can change the spindle speed in the different stations, but so far we have to live with one spindle speed for any one job. This almost always presents a problem of varying surface feet at different diameters. In the past, if it was decided to tool a job with carbide, we used all carbide, but it just didn't always work out. Carbide and low surface feet do not go together. So we started combining carbide with tantung and high speed with fairly good results.

Where the dividing lines are between carbide, tantung and high speed, depends upon the material and grade of carbide used. Engineering departments make some pretty good guesses, but the answers generally come from the old "cut and try" method. The main thing is to recognize the problem; thus it can be solved more easily.

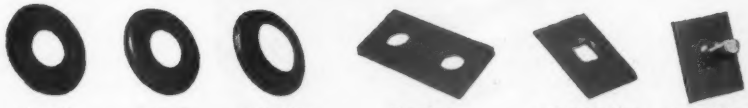
The problem of chips and chip clearance is present on any machine tooled with carbide, but to some extent it is accentuated on a multiple spindle because the tooling area per spindle is necessarily more limited than on a single spindle machine. The holders and tools are closer to one another, leaving less room for the chips to get away.

When you are cutting steel on eight

(Continued on page 100)

PRESS-RITE POWER PRESSES

...KEEP PRODUCTION HUMMING!



Blanking • Forming Extruding Piercing Countersinking Assembling

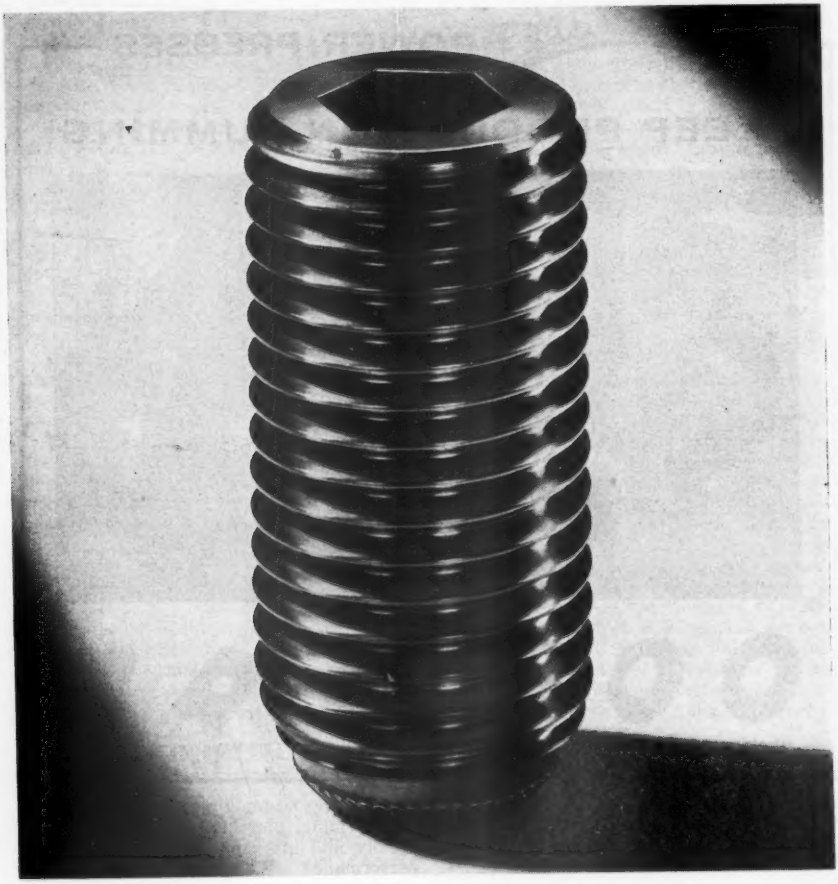
Dalhart Engineering & Manufacturing Co., Inc., of Van Dyke, Michigan, banks on 30-ton Press-Rites for top speed production with low maintenance and operating costs.
Says Mr. E. F. Paner, President & General Manager: "Our operations require production equipment of great versatility and high efficiency in varied applications. We're using 30-ton Press-Rites for blanking, forming, piercing, extruding and assembly and are right pleased with their performance. We've found Press-Rites stand up well . . . need little maintenance even under hard, continual usage. They're tops with operators, too . . . for safe and easy operation."

Find out how Press-Rites can help solve your production problems.
Write for complete information, TODAY!

7 MODELS
CAPACITIES
5 TO 85 TONS

Sales Service Machine Tool Co.
2363 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS



For positive, vibration-resistant SELF-LOCKING UNBRAKO SOCKET SET SCREWS

UNBRAKO Self-Locking Socket Set Screws won't work loose. Non-slip internal wrenching provides positive drive. Self-locking feature prevents creep and subsequent loosening. Machinery stoppage and production losses are materially reduced. Write for descriptive literature. STANDARD PRESSED STEEL CO., Jenkintown 36, Pennsylvania.

Standard UNBRAKO *Self-Locking Set Screws, #4 to 1" inclusive, are available from your* UNBRAKO *distributor's stocks. Ask him for your supply.*

SPS

See us at the A.S.T.E. 20th Annual Convention, International Amphitheater, Chicago, Ill., March 17 to 21, 1952

JENKINTOWN, PENNSYLVANIA

UNBRAKO SOCKET SCREW DIVISION

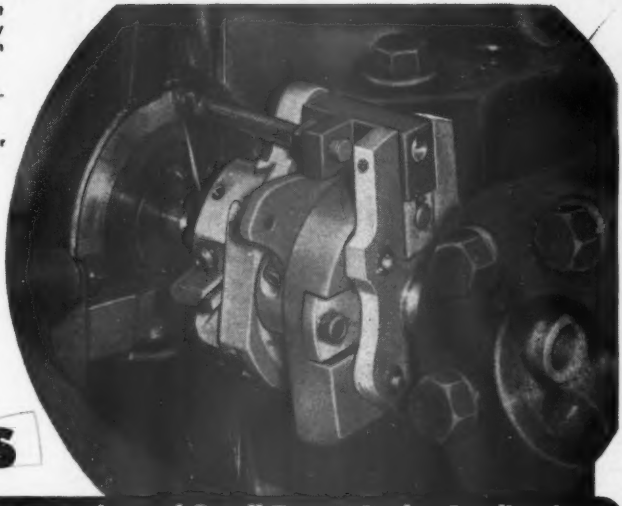
CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

★ Simple, compact design combines light weight with strength, to function dependably and accurately at high indexing speeds, with long runs between grinds.

★ All important bearing surfaces are hardened and ground and hand lapped.

★ All external surfaces are chrome plated for protection.



JONES & LAMSON
AUTOMATIC OPENING
DIE HEADS

for Brown & Sharpe Automatics and Small Turret Lathe Applications

Designed and built for high production quality threading, these new J&L dies perform with smooth, easy action, unusual repetitive accuracy, and year 'round dependability at low cost. They will give you maximum productive machine hours each day.

No. 16-S is for use on No. 00 and 00G and No. 0 and 0G Brown & Sharpe Automatics and small turret lathes. It uses long wearing ground thread, radial type chasers *with two cutting edges.* These DUALIFE chasers are easily and quickly removed and replaced in their holders. When one edge wears out, just turn them over, and you have the equivalent of a new set of chasers. Minimum down time and maximum production result.

No. 18-S and 19-S Model 18-S is for use on No. 0, 0G and No. 2, 2G Brown & Sharpe Automatics. Model No. 19-S with wider capacity range, is for use on No. 2, 2G Brown & Sharpe machines. Both are also used on small turret lathes. They have Tangent type chasers, ground all over, incorporating the exact helix angle and thread form. They are easily removed and replaced without disturbing the head and holder assembly. Many of these chasers are interchangeable between the two models and other standard J & L Tangent Die Heads. Carbide chasers can be used when conditions permit.

WRITE DEPT. 710 FOR TANGENT AND RADIAL DIE CATALOGS

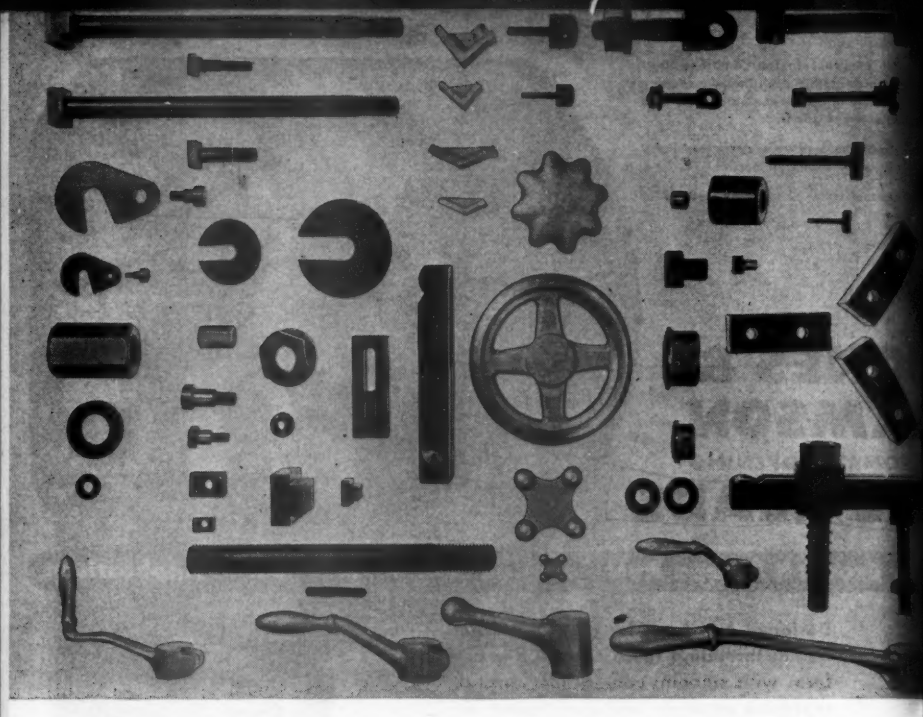
JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

J&L ®

DIE HEAD DIVISION



SPECIFY THE LINE

JERGENS MASS-PRODUCED STANDARDS:

There's Over 375 Component Parts Alone! Plus Hand Wheels — Lever Knobs — Clamp Assemblies and Chuck Jaw Blanks.

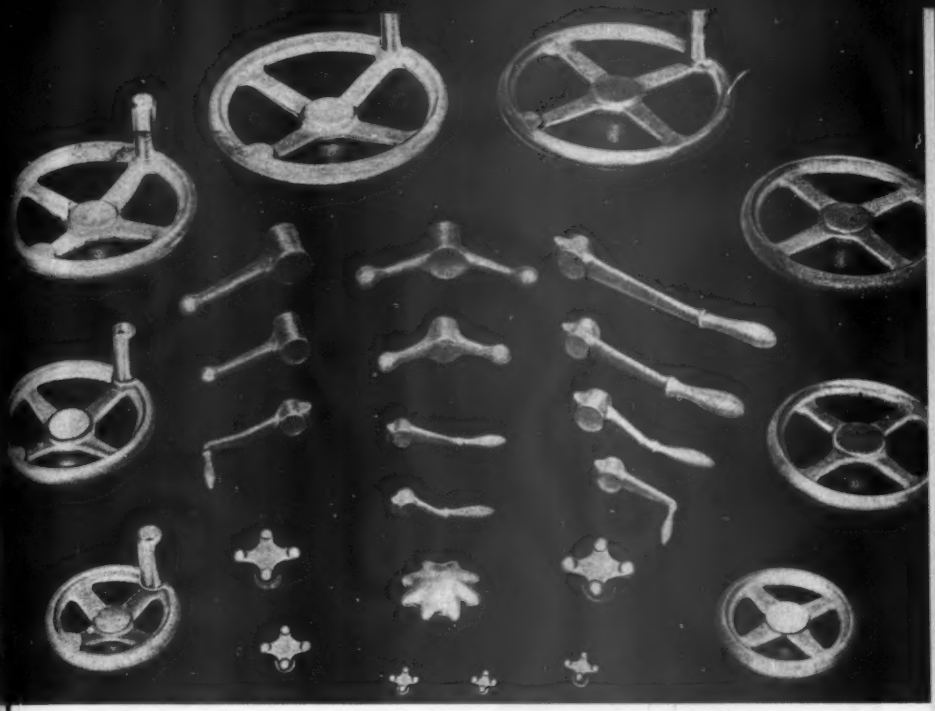
There's big savings in design, tool room and production time and facilities when you use Jergens mass-produced components as standard in your plant. Among the most complete lines in production today, Jergens Components never compromise with quality. Every item is precision made of heat-treated alloy steel many with anti-rust black penetrate finish. Jergens Standards hold up in the toughest applications usually outlasting the jigs and fixtures on which they are used. Specify the complete line that saves your time. A full scale, 54 page template catalog is available on request.

JERGENS' SINE FIXTURE KEYS:

Here's a new Jergens Production Booster that will save you up to 50% in labor costs alone in the laying out and milling of fixture base plates. The unusual stemmed construction of the "S" Fixture Key requires a bored hole in lieu of the standard milled fixture key slot thereby eliminating the complete need for a milling operation and set-up.

Jergens TOOL SPECIALTY CO.

712 E. 163rd ST. . . . CLEVELAND 10, OHIO



THAT SAVES YOU TIME!

JERGENS' UNMACHINED ALUMINUM CONTROLS:

Immediate delivery on every item in our cast aluminum line—shipped the same day your order is received—providing your order is for unfinished controls. Hand wheels are available in straight or angled shapes; hand knob in 6 sizes; offset handles in 4; crank handles in 3; speed handles and clamping levers in 2 sizes all tumbled and require little finishing.

MAIL THIS COUPON FOR FREE COPY OF JERGENS' NEW FOLDER

SEE US AT THE ASTE SHOW IN CHICAGO

Jergens Tool Specialty Co.
712 E. 163rd St., Cleveland 10, Ohio

Please rush your new folder and additional information about
☐ Jergens' Standards ☐ Sine Fixture Key ☐ Unmachined Aluminum Controls.

NAME .....

Title .....

Company .....

Address .....

City ..... State .....

. . . Armor Steel, from page 64

vertical movement of the knee.

This is a rather unusual setup, since the conventional control of the vertical movement had to be maintained. To accomplish this, a hydraulic motor was used instead of cylinders and the connection was made with a shaft equipped with two universal joints and a clutch to disengage the hydraulic unit. This can be seen rather clearly in Figure 4. The fixture was rather heavy, so to balance the tracer unit hydraulically, the mill was equipped with counterbalances, as seen in the rear of Figure 5.

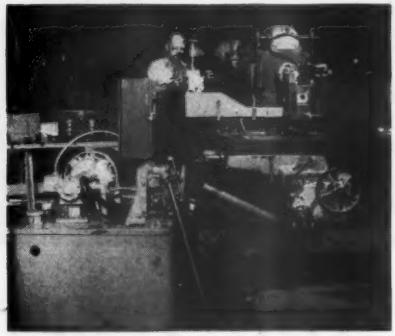


Fig. 4. The second operation is run on a number five horizontal mill equipped with a tracer follower which controls the vertical movement of the knee. The details of this unusual setup are explained in the text.

To expedite cutter changes, the spindle was equipped with a modified standard quick-change adapter and all cutter arbors were made to fit. The modification was needed because the spindle had a #14 Brown & Sharpe taper and consisted of making the arbors with a stub taper and knockout slot similar to a drill sleeve. Setting blocks and gages were furnished to minimize dependence upon operator knowledge.

Two templates are required since the two sides have a different profile. The template change was fool-proofed by using two different size and location dowel pins in each bracket template. Cutters on this operation were high speed inserted blade type shell end mills. The template, cutter and stylus and a cutter setting gage can be seen in center of the view of Figure 5.

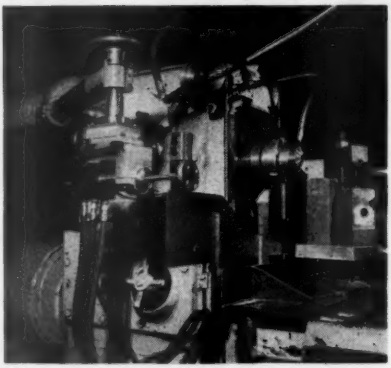


Fig. 5. This close-up of the operation shown in Figure 4 shows tracer, template and stylus, cutter, and cutter setting gage. To the rear can be seen the counterbalance for offsetting the fixture weight.

The coolant used in this operation is soluble oil.

The Driver's Hatch is then profiled, the seal slot out, tab slots cut and hinge holes located. Referring to Figure 2, these are seen at "A", "B", "C" and "D", respectively.

This operation is performed on another horizontal boring mill equipped with a unit to control vertical travel of the head and cross travel of the table. The

(Continued on page 98)

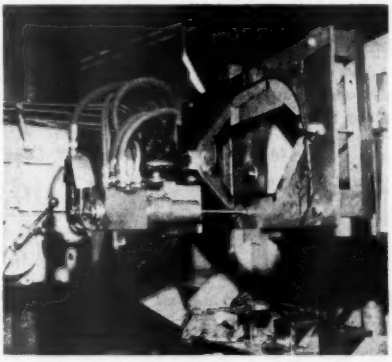


Fig. 6. This view of the duplicator control for the tracer horizontal boring mill shows the primary template (which controls the hatch and seal slot profiles) and the secondary template for profiling the tab slots.

Tired of Grinding Cutters?

Then switch to the "FUTURMILL"—the only face milling cutter with indexable solid carbide blades.

Say goodby to problems connected with shortages of cutter grind personnel, diamond wheels, blade breakage, brazing strains, etc.

TWO MODELS . . .

MODEL S—For those tough steel milling applications—cast armor—sandy castings, etc. The square carbide blade can be indexed eight times before any grinding is necessary. Just a flick of the wrist—you can index right on the spindle. For either face or straddle steel milling, or cast iron work into a shoulder.

MODEL O—For cast iron or nonferrous materials. The octagon shaped blades can be indexed sixteen times before sharpening.

Send for your copy of the Catalogue on the *milling technique of tomorrow.*

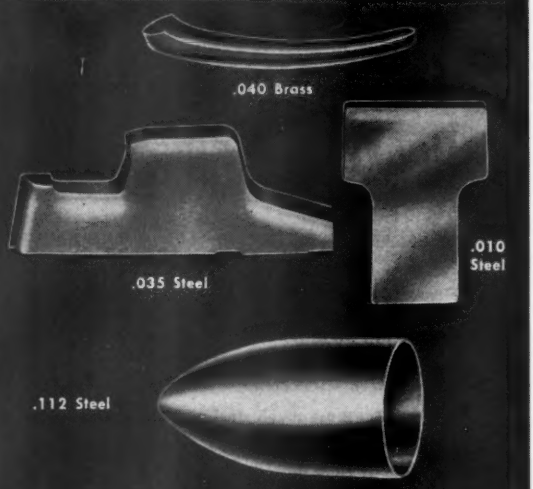
Milling Cutters

futur DETROIT MILLING CUTTER CO.

28625 GRAND RIVER • FARMINGTON, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Eliminate Multiple Trimming Operations



Increase output...reduce costs!

Costly, time-consuming trimming and notching operations can be done in one operation with a Brehm Trimming Die. Don't worry about stock thickness. Edges will be of full thickness—clean, flat, without burrs or distortion at the trimmed edge.

Other Brehm Die advantages! **Workable Materials**—gold, silver, stainless or mild steel, copper, brass, zinc, aluminum, fiber, rubber, plastics, or what did you have in mind? **Quantities vary**—stove or refrigerator doors, auto bumper buffers or typewriter covers, from 264 to 900 per hour. Intermediate parts, where stock and scrap can be blown from the die, about 1200 per hour. **Shapes**—fountain-pen ferrules, artillery cases, watch cases, burial vaults, automotive, kitchen, radio and television accessories and parts. Almost anything *you* need trimmed.

A Brehm "Shimmy" Trimming Die with angular cams, cuts four ways in one press stroke, handling straight or curved edge contours, with multiple notches and projections. Slow, costly "horn" and "pinch" trimming operations, are eliminated.

Write today . . for your free copy of the Brehm Die Catalog. If you wish, submit blueprints or parts for full information or quotation.

Brehm® TRIMMING DIES

THE "SHIMMY" REG. DIE

THE STEEL PRODUCTS ENGINEERING CO.

BREHM DIE DIV., DEPT. B, SPRINGFIELD, OHIO

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Look who's sporting a halo!

More production . . . ground faster. That's why the foreman is so well pleased with himself . . . and with the rugged, stand-up performance of Simonds Abrasive Company resinoid bonded grinding wheels . . . real money savers on production operations . . . and part of a complete line including grinding wheels, mounted wheels and points, segments and abrasive grains.

Bulletin ESA 62 describes Simonds Abrasive Company resinoid bonded wheels. Let's send it to you, together with full information on our complete line and the name of your nearest Simonds distributor. Write for them today.

SIMONDS ABRASIVE CO.
Grinding Wheels

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Armor Steel, from page 94

profile is cut first to proper depth using a stylus size which leaves .010" stock per side. A carbide-tipped inserted blade shell end mill is used for this phase of the operation.

The seal slot is then milled with an end mill of the proper diameter and a stylus of the correct size to finish the profile. This was done to eliminate any step in the two depths.

The tab slots are in the inner section of the profile. To cut these, a secondary template was mounted behind the main template and the slots are profiled, using the same cutter and stylus as used for the seal slot. This can be seen in Figure 6 which shows the primary template (for profiling the Driver's Hatch and seal slot) and the secondary template which controls the profiling of the tab slots.

Fig. 7. This view of two rough castings of the Commander's Vision Cupola gives a good idea of its intricate shape and of the areas to be machined.

The hinge holes are located in this operation also. Holes of ⅜" diameter were drilled in the main template in the correct location for the holes. A cone pointed stylus was also used to locate in these holes and a center drill is used in the spindle.

The final drilling, spot-facing and tapping are done on a radial drill, the part being located on the profile face and by the hinge holes. After drilling, the part is inspected, deburred and is ready for welding.

The second part that is being used for an example is the Commander's Vision Cupola. Figure 7 shows two views of the rough casting which gives a good idea of its intricate shape and of the areas to be machined. This part is also inspected and the casting qualified before any machining can be done.

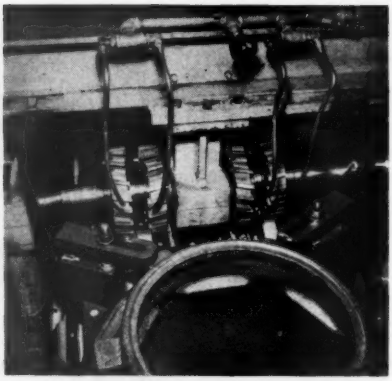


Fig. 8. Straddle milling the hinge lugs. This operation is performed on a duplicating miller.

The first machine operation consists of turning the bottom face and locating ring which is used in all subsequent operations for locating purposes.

Carbide-tipped tools with a chip breaker are used. To properly protect the cutting edge from chipping, a negative rake angle is needed. To obtain this rake angle and conserve scarce carbide, the chip breaker shelf only was ground with a 5° negative

(Continued on page 138)

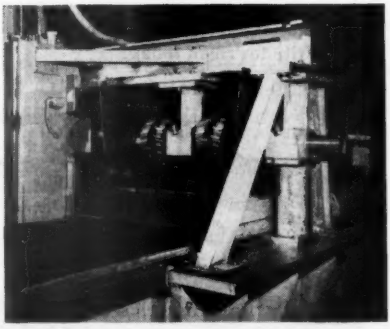


Fig. 9. The auxiliary outrigger arbor support built for the straddle milling operation shown in Figure 8.

● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 45 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Representatives in major industrial centers.

Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

National
TOOL CO.
Cleveland 2, Ohio

Contract Services.
Milling Cutters

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Automatics, from page 88

spindles at the same time, at the proper feeds and speeds, you are making a barrel of chips and have to get rid of them.

Care must be taken when laying in the holders, not to create pockets and places for chips to gather. We always try to get the heaviest machining done in the lower positions directly above the chip pan, and do the finishing cuts in the top positions.

We have found that coolant lines should be run into the rear of the tool holders and the holders drilled to direct the flow right to the cutting edge. If coolant pipes are run in close to the tooling, they aid to the obstacles in the way of the chips.

Chip breakers have to be developed for the tools just the same as on any carbide job. The only thing I want to bring out here is that once a chip breaker is developed it should be accurately recorded on the tool print, and special care should be taken to reproduce it every time.

It only takes one or two tools with bad chip breakers to foul up a multiple spindle machine.

The development of mechanically held tangent solid carbide tools has been a great assist to multiple spindle tooling because of their quick change and easy regrind features. Very often we are unable to use a standard holder of this type in the space available, but we always try to develop a special holder to fit the space, using the same holding principle. In using this type of tool it is always better to tool with a larger bit when in doubt about the strength required.

You cannot over-emphasize rigidity.

Until recently, these solid carbide tools came in round, square and triangular shapes. Now we have the diamond shape added, which more resembles a brazed tool used to face down to a shoulder. You lose two cutting edges on each end, but the additional strength and ability to blend in a corner are well worth it.

We have found that wherever it is possible to single point a cut, it should be done. Forming small radii and chamfers works fine, but trying to form large radii and long angles is apt to make lots of trouble unless excess stock is removed in small doses beforehand. It is much better to build a special slide operated either by the standard slides or independently in order to give you the desired angle or to generate the desired radius with a single point tool.

The preceding paragraph is a departure from accepted tooling with high speed on multiple spindle machines when carbide is used. There are other departures also, and one of these concerns the plunging of tools at high speed along a diameter already partly turned or a face already partly turned by a preceding tool. I personally feel it is better to make the cams long enough to turn or face the full length of any one cut. In other words, wherever possible, guard against one tool being dependent upon the successful cut of a preceding tool. **The scrap, breakage and down time eliminated will more than offset the additional time required to make the piece.**

Another departure concerns feeds and cams. The general practice in high speed tooling is to make the cams as short as possible for taking a particular cut, because the lower the feed the better the finish and tool life. Not so with carbide. We often deliberately make a cam much longer than necessary to get an adequate feed. Low feeds will wear carbide unnecessarily but, still more important, low feeds will not allow you to break the chips. We shoot for around .008" as a minimum, to handle the chip and insure good tool life.

Still another departure from high speed tooling concerns the amount of stock left for the finishing cuts. Ordinarily, the less stock left for finishing with high speed, the better; but with carbide the ever-present chip problem dictates leaving enough stock to break and control the chip, and I believe that most carbide men will agree that a better finish is obtainable when removing $\frac{1}{16}$" on a diameter rather than a few thousandths of an inch. As a matter of fact, carbide finishes are very good even on heavy cuts, and very often we leave out a roughing tool that you would have to have in a high speed setup.

On most multiple spindle machines the tool slides are timed to reach the high point at the same time, and occasionally at this high point, when all the tools are cutting at once, you run short of horse power. It is good designing practice then to try to distribute this peak load more evenly. Computation may show that you

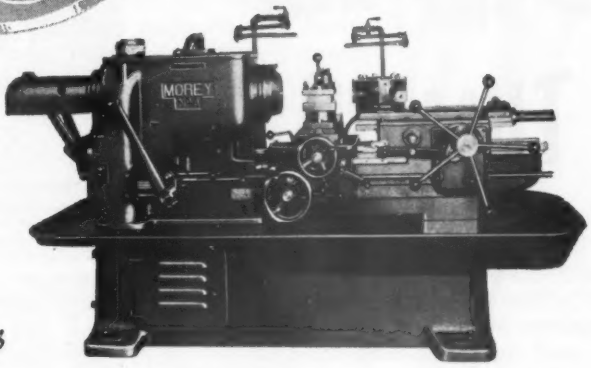
(Continued on page 104)

MOREY

TURRET LATHES

No. 2 Plain Type

Nos. 3, 4 and 5 Universal Type



Features

Infinite variable vibrationless spindle speeds.

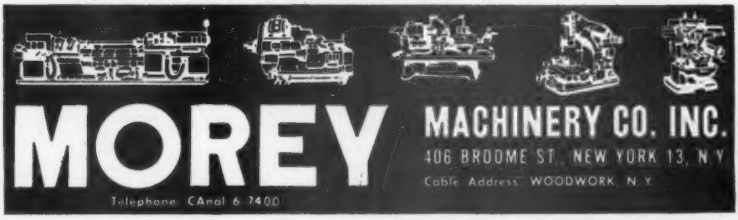
Remote speed selection control for speed and ease of operation.

The newly designed MOREY TURRET LATHES take advantage of tungsten carbide tools and incorporate all technical improvements in metals, electronics and hydraulics . . . our design is not hampered by tradition.

Size	Bar Capacity	Swing	Motor
No. 2 Plain.....	1" x 6"	14"	3 HP
No. 3 Universal....	1⅛" x 10"	16½"	5 HP
No. 4 Universal....	2" x 12"	19½"	7½ HP
No. 5 Universal....	2½" x 14"	21¼"	15 HP

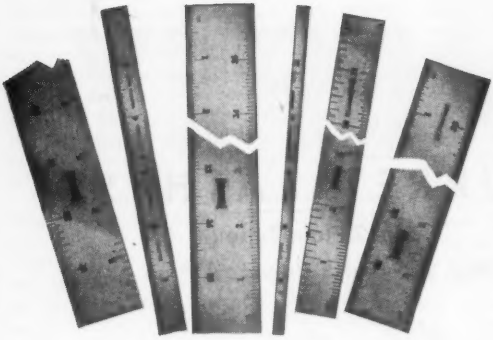
FOR BAR and CHUCKING WORK

OBTAIN MAXIMUM PRODUCTION WITH MINIMUM EFFORT FROM MOREY TURRET LATHES . . . INVESTIGATE!



Visit our Booths at the ASTE Exposition in Chicago where our experts will be ready to assist you in your machinery problems!

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS



TUMICO
Steel Rules

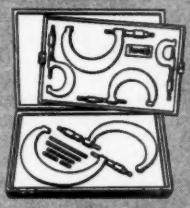
Accurately ground and graduated with dark, contrasting, easily read lines and numbers. Made from spring tempered steel, rigid, semi-flexible and full flexible. Many combinations of English, Metric or English-Metric graduations. Special rules and scales made to specifications. Write for free catalog.

TUBULAR MICROMETER CO.
ST. JAMES, MINNESOTA

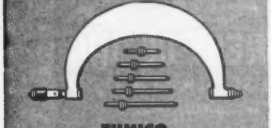
SEATTLE • LOS ANGELES • DENVER • DALLAS • CHICAGO • MINNEAPOLIS • KANSAS CITY
DETROIT • ATLANTA • NEW YORK • TORONTO, CANADA • EXPORT OFFICE: CHICAGO

FOR EVERY JOB
TUMICO
PRECISION MEASURING INSTRUMENTS

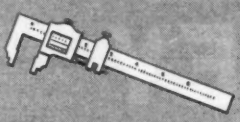
TUMICO POST GAGES
Precision micrometer or dial indicator instruments adaptable to a wide variety of uses. 10 models.



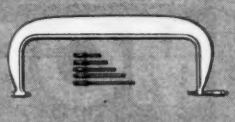
TUMICO MICROMETER SETS
Complete sets for a broad range of accurate measurement operations. From 0" to 30" in 1" steps.



TUMICO OVER-THE-BAR MICROMETERS
Precision bore measurement without removing boring bar. 11 models from 3" to 28".



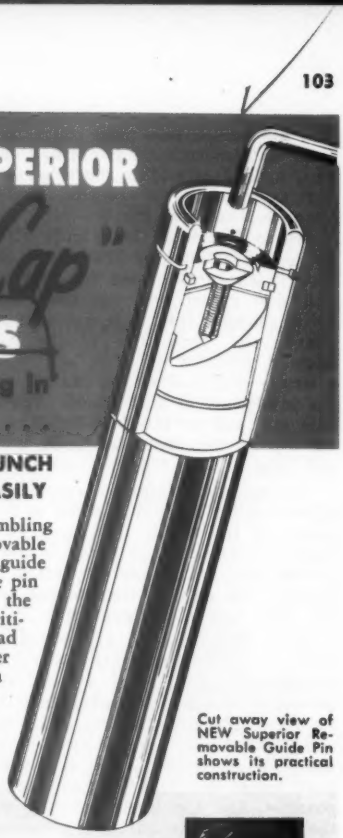
TUMICO VERNIER CALIPERS
Precision made. Accurate, clearly etched graduations and numerals. 24 models from 6" to 48".



TUMICO BAR MICROMETERS
Provide a wide range of precision measurement with low investment. 30 models from 6" to 168".

NEW! SUPERIOR "Removable Cap" GUIDE PINS

End Troublesome Binding In Die Set Assembly Work . . .



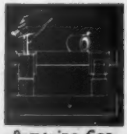
Cut away view of NEW Superior Removable Guide Pin shows its practical construction.

HEXAGON KEY REMOVES CAPS TO FREE PUNCH HOLDER . . . DIES PART QUICKLY and EASILY

It is no longer necessary to spend excessive time in assembling and disassembling large die sets! Superior's *NEW* Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can easily do this work alone in a few minutes. As a result overall die costs are substantially reduced. Complete information is available on request. Save by using these advance type guide pins in your die sets. Write, phone or wire your needs now!

THESE 9 FEATURES SAVE COSTLY MAN HOURS IN DIE MAKING

1. Removable caps prevent punch holder from locking.
2. Socket screws serve as jacks — caps detach quick and easy.
3. Self contained oil reservoir in each guide pin cap — oils bushings.
4. Designed for use on all die sets.
5. One man can remove large punch holder in approximately 3 minutes.
6. Punch holder assembled easier and more accurately.
7. Guide pins are precisioned machined and finished for long wear.
8. Taper seat for cap insures positive alignment.
9. Damage to costly dies in assembly and disassembly is eliminated.



Removing Cap

Parting Die Set

Replacing Die Set

FOR FAST LOCAL SERVICE CALL THESE SUPERIOR REPRESENTATIVES

- Kalamazoo, Mich. — Phone 7988
- Indianapolis, Ind. — BRoadway 5668
- Chicago, Ill. — CEntral 6-3869
- Dallas, Tex. — Riverside 5138
- Syracuse, N.Y. — 2013 James St.
- Rockford, Ill. — Phone 33931
- St. Louis, Mo. — Lucas 1223
- Milwaukee — Mitchell 5-6027
- Dayton, Ohio — Hemlock 6209

SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Automatics, from page 100
need much more horse power at this point. But, instead of adding more horse power just to cover a few seconds of the cycle time, you can stagger the high point of slides so that some heavy cuts will finish up ahead of others; preferably on cuts that finish in the open where the dwell and slow return will not wear the tool. To accomplish this, it is not necessary to change the cycle time of the machine. Instead, advance the slide and change to a longer lead cam so you can run up over the low point in high speed. The longer cam will add to the feed but nine times out of 10 the increased feed will help tool life.

Another good thing to consider in designing is the amount of dwell at the high point of the cams. Unlike high speed tooling, where a long dwell is desirable, carbide will wear and very often set up chatter. **So, on cuts that do not finish in the open "get in and get out."**

From time to time I have mentioned such tool holder design factors as strength, coolant supply and the use of identical screws for holding and adjusting. To this I want to add allowance for chips to clear, and wedge design for holding. The holders should be designed so that they give support under the tool and as far out as possible, and the top or cutting part of the tool should be left in the open as far back as possible. To help in accomplishing the latter we are using a wedge for holding the tool down, rather than screws and a strap. Care should be taken that the wedge angle is not a locking angle, preferably about 25 degrees. The center of the side of the wedge against the tool can be relieved so as to cut down area and readily release the tool.

Getting back to multiple spindle bar machines and carbide tooling. Almost everyone in the automatic business has at one time or another tried to convert one of their bar machines to carbide, and probably wishes I wouldn't even bring up the subject. **"Let sleeping logs lie"** or something like that. Seriously though, there are many bar machine jobs adaptable to carbide tooling, particularly tubing jobs.

There are several limiting factors on bar machines, and I believe the main ones are forming, drilling and cutting off. Now that all of these things are being done in particular instances, what you have to guard against is trying to do them all on the same job. **You can't just arbitrarily decide to run a job with carbide.** It must be analyzed for these trouble spots, and I would say that if only one, and not much of another, is present, give it a try.

On all bar machines the piece has to be cut off, so the big carbide problem child is always present. Cutting off to center with carbide is just about out of the question, so a combination of carbide and high speed must be used. This is a difficult operation because the high speed blade will burn at the high surface feet of the larger diameters if it contacts them. Your only bet then is to try to cut off into a bored hole or to cut off tubing.

Using solid stock also presents quite a problem when the piece to be machined calls for a bore. If it is a small hole and is within the high speed drill range there is no problem, but if the bore diameter gets into the carbide surface feet range, your troubles begin. There are combination high speed and carbide drills for steel, but look before you leap. If the center of the stock can be drilled with high speed large enough to follow up a carbide or tantung boring tool, it is worth a try. Again, tubing is your best bet.

If wide forming is going to be part of a proposed carbide setup, go slowly because the very nature of the way carbide cuts is against you. It requires enough feed to split the stock off the bar so that the cutting edge does not actually contact the work; but if you give a wide carbide form tool enough feed to do this, you will stall almost any motor that could be put on the machine. At feeds within the range on bar machines, wide carbide forming tools will wear rapidly and can become very expensive. As I have mentioned previously, you can arrange to single point the form, through the medium of special slides, etc., and the results will be much more satisfactory.

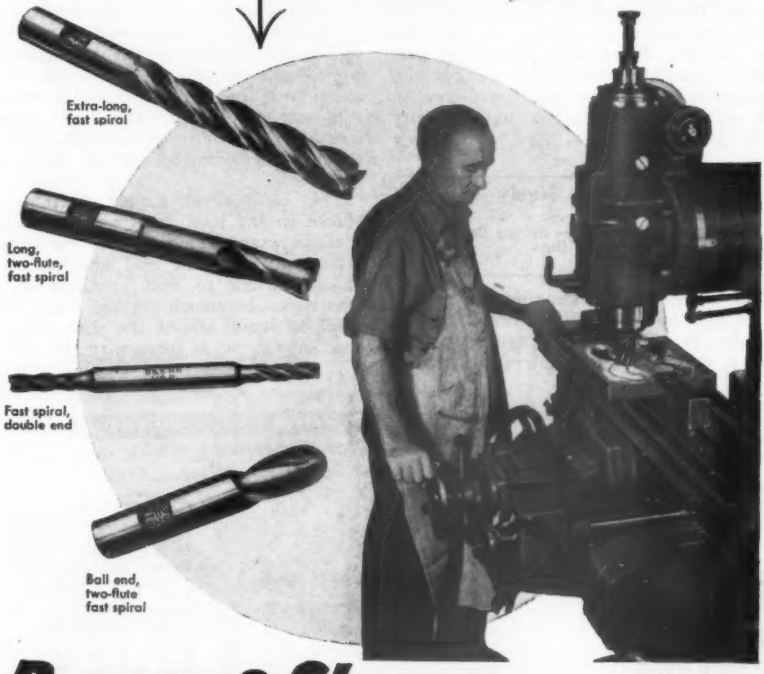
Tooling automatics with carbide is a fascinating business, and the reward for success is great, in terms of increased production and profit. I hope that the facts and problems mentioned in connection with this tooling will not discourage, but rather help in a more sound approach.

End Mills that Save Down-Time

Precision-made end mills that meet the highest standards of cutter design cut faster, more freely, and with less power. They turn out more work between sharpenings — reduce machine down time.

Brown & Sharpe End Mills are made under exacting quality control, from start to finish. Steel formula and heat treatment are closely held to rigid specifications. Careful machining maintains consistent adherence to design standards. Write for complete catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

WE URGE BUYING THROUGH THE DISTRIBUTOR



Brown & Sharpe B·S

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Statistical Quality Control at The Universal Wire Spring Co.

(Continued)

Rather than try to adjust and control quality by checking individual spring samples, again the principle of taking five consecutive pieces has been established. Here too, no machine is adjusted unless three out of the five are beyond the tolerances which we have reduced by one-half as was done in the inspection procedure at the corrugators. Figures 9 and 10 show a close-up of two typical back spring inspection gauges developed by the Quality Control Department for rapid checking of each angle of bend and the relative dimensions. The diagrams indicate in detail how these gauges can be used to control the various points on the spring important to high quality back spring assemblies.

by **W. H. Neely**
President
The Universal Wire Spring Co.
Bedford, Ohio

The results of this gauging are recorded on the "np" chart in the center of this picture. If any one of the control points, a, b, c, or d are beyond tolerances, this is indicated in the chart. A summary of these charts is made each week in the same manner as the summary "X" charts in order to give Management a running report on the operation of the Back Folding Department from a quality control standpoint. Control limits are placed on the summary chart so that the operating characterisitics of any one machine throughout the week can be evaluated.

The Maintenance Department also uses the summary sheets to determine any one point that may possibly be giving trouble, thus indicating that repair or maintenance work must be done to the machine. By using both the "np" chart and a running summary of the "np" charts the inspectors are much more confident of their decisions regarding the springs being produced.

The compressed folded springs are placed in the heat treatment furnace at a temperature which relieves the stresses set up while folding and sets the height of the spring to that specified on the drawings. Inasmuch as the heat treatment in itself affects the dimensions of the spring, it is necessary to set up

(Continued on page 110)

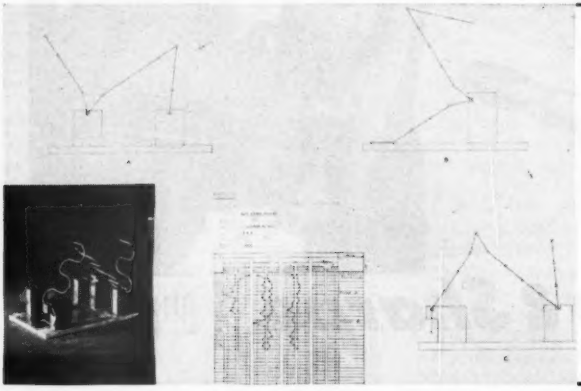


Fig. 9. This is a typical seat back spring inspection gauge as developed by the Quality Control Department for rapidly checking each angle of bend and the relative dimensions. The profile diagrams show how the gauge indicates those points important to high quality assemblies.

Grinding and finishing welds on a stainless steel tank with a Bayflex Reinforced Disc-Wheel, 9" dia. x 3/16" thick, weight 1 pound.

Bayflex® Disc-Wheels

CUTTING ACTION . . . fast and smooth. Has enough resiliency to hug the work. Capable of rough cutting as well as blending.

DURABILITY . . . outlasts up to 50 (or more) ordinary sanding discs. Withstands a lot of rough usage.

RESILIENCY . . . a degree of deflection is possible . . . a great safety factor.

TECHNIQUE OF USE . . . Apply to work at an angle of approximately 35° using the weight of the machine for pressure. Maintain full speed for most efficient operation.

OTHER APPLICATIONS . . . Weld removal on angle iron, pipe, or other structural steel. Mill scale removal. Chamfering metal preparatory to welding. Smoothing down flame cut edges. Light snagging, deburring, blending and finishing soft, non-ferrous materials.

Formerly this job required a 3½ pound cup wheel for rough grinding plus a sanding disc for finish grinding. This caused operator fatigue and wasteful machine "down-time".

The New Way . . . The Bayflex Way!

Rough grind and finish where required with a single Bayflex disc-wheel in a fraction of the time . . . EASIER . . . SAFER . . . MORE ECONOMICAL.

BAY STATE

Bay State Abrasive Products Co.
Westboro, Massachusetts
Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario

Send for information-packed "Big Three" catalog. It contains mounting instructions, recommended speeds, charts, applications, etc.

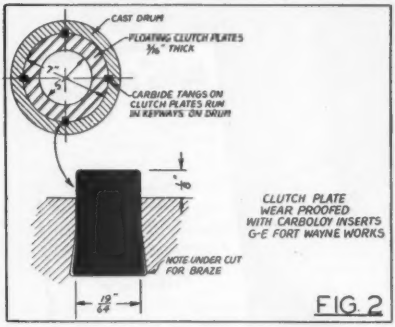
Abrasives: Discs

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Resistance, from page 82

cut slots in the plate to replace them, and then braze a modified standard Carboloy cemented carbide blank into the slot, Figure 2.

A somewhat heavier braze thickness than normal in carbide practice is employed, the slots being undercut to provide the necessary clearance for the braze. The reason for this procedure is to give the tangs additional "cushioning" to withstand the stresses involved.


CAST DRUM
FLOATING CLUTCH PLATES 3/16" THICK
CARBIDE TANGS ON CLUTCH PLATES RUN IN KEYWAYS ON DRUM
CLUTCH PLATE WEAR PROOFED WITH CARBOLOY INSERTS G-E FORT WAYNE WORKS
NOTE UNDER CUT FOR BRAZE
FIG. 2

With no sign of wear after more than a year of service, total life of the salvaged plate, wear proofed with Carboloy cemented carbide, is still indefinite. The importance of the savings obtained from this one item may be visualized when it is considered that the improvement is being applied to many machines.

Use of Carbide Bushings Saves Machine Shut-Downs

G-E's Fort Wayne Works have found that when operating a large number of automatic machines of the same type, a small recurrent expense on each machine can total up rather rapidly. Similarly, small savings per machine in maintenance time and cost also total up to respectable figures each year.

Until recently, some machines at the Fort Wayne plant had to be shut down on an average of one every month to replace a hardened steel insert that fed wire from the machine.

Replacing hardened steel bushings with special Carboloy cemented carbide bushings, Figure 3, has resulted in the elimination of at least five shut-downs per

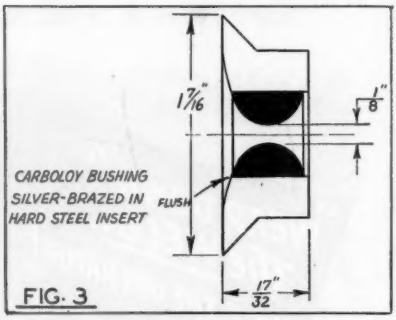
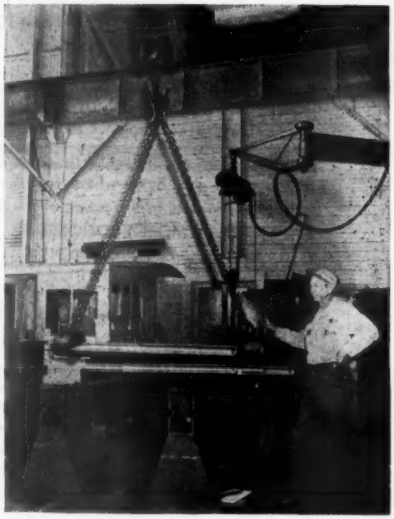


FIG. 3

year. While the annual savings per machine is relatively slight, the total cost for the 250 machines added up to a tidy amount when translated into hours of non-productive labor, etc.

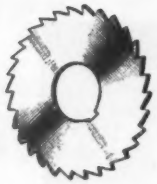
★ ★ ★

ANTI-FUMBLING DEVICE (below). They don't drop shafts at the Torrance, Calif., plant of The National Supply Company, manufacturers and distributors of oil field machinery and equipment. A short piece of pipe, capped on one end and with welded hook and handle, is placed over each end of a shaft prior to lifting. The open end of the pipe is flared to make positioning easier.



Victor's Specials Deserve Your Attention!

METAL SLITTING SAWS



Hollow Ground • High Speed

FIRST QUALITY • IMMEDIATE DELIVERY

Diameter	Thickness	Hole	Price
2½"	1/32"	7/8"	$2.52
2½"	3/64"	7/8"	2.52
2½"	1/16"	7/8"	2.52
2½"	3/32"	7/8"	2.52
2½"	1/8"	7/8"	2.61

Diameter	Thickness	Hole	Price
3"	1/32"	1"	$2.97
3"	3/64"	1"	2.97
3"	1/16"	1"	3.06
3"	5/64"	1"	3.40
3"	3/32"	1"	3.06
3"	7/64"	1"	3.50
3"	1/8"	1"	3.15
3"	5/32"	1"	3.70
3"	3/16"	1"	3.80

Diameter	Thickness	Hole	Price
3½"	1/32"	1"	$3.87
3½"	3/64"	1"	3.96
3½"	1/16"	1"	4.05
3½"	3/64"	1"	4.23
3½"	3/32"	1"	4.23
3½"	7/64"	1"	4.50
3½"	1/8"	1"	4.50
3½"	5/32"	1"	4.68
3½"	3/16"	1"	4.95

Diameter	Thickness	Hole	Price
4"	1/32"	1"	$3.87
4"	3/64"	1"	3.96
4"	1/16"	1"	4.05
4"	3/64"	1"	4.70
4"	3/32"	1"	4.23
4"	7/64"	1"	5.00
4"	1/4"	1"	4.50
4"	5/32"	1"	4.68
4"	3/16"	1"	4.95

Diameter	Thickness	Hole	Price
5"	1/16"	1"	$5.22
5"	3/32"	1"	5.67
5"	1/8"	1"	5.94
5"	5/32"	1"	6.30
5"	3/16"	1"	6.66

TOOL OF THE MONTH

Sets of Needle Files

Made in Switzerland

LENGTH o/a	CUT	PRICE
6¼"	00	$3.50
6¼"	0	3.50
6¼"	1	3.50
6¼"	2	3.50
6¼"	3	3.50
5½"	0	2.75
5½"	2	2.75

12 different shapes to Set

VICTOR MACHINERY EXCHANGE, INC.

DEALERS IN TOOL ROOM EQUIPMENT

251 P Centre St • New York 13, N. Y. • Phone CAnal 6-5575

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Quality Control, from page 106

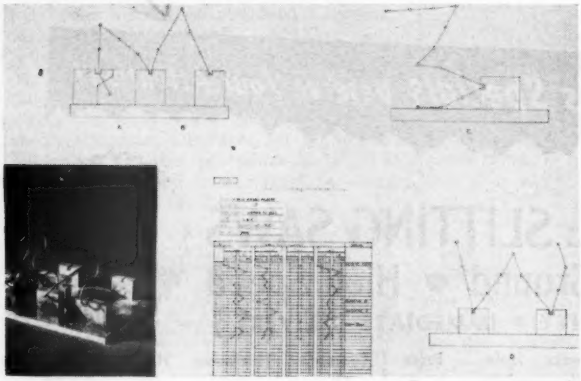
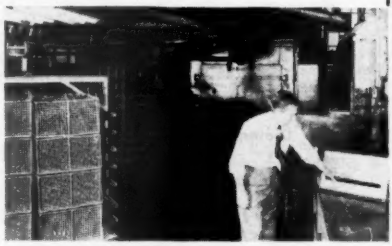


Fig. 10. (left) Another back spring gauge similar to the one shown in Figure 9. The results of these gauging operations are recorded on the "np" charts to show whether any of the control points are beyond tolerance.

Fig. 11. (below) From the folding machines, the springs are heat treated in the furnace shown in background. A spring is being compared with the final checking template.

quality control after heat treatment. This inspection consists merely of comparing the finished spring on a template. It is unnecessary to record the results of this inspection because if the springs are folded properly and the correct temperature is maintained the springs will be within tolerance. The template check is only a periodic check on furnace temperatures and their effect on any change in wire characteristics.

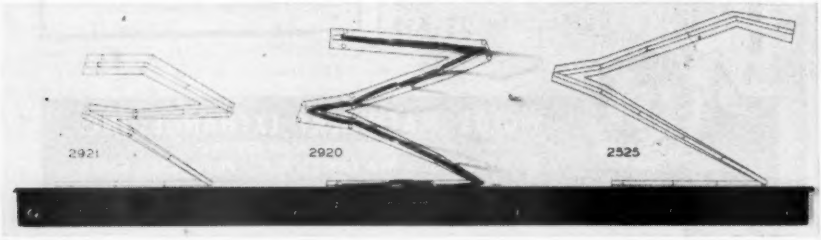
Figure 11 shows the spring on the final checking template. This picture also shows the method of handling springs as they come from the folding machines and are heat treated in the furnace shown in the background. Figure 12 is a close-up of the back spring template with a center "M" in position. The other two forms shown on the template are used for the two additional types of folded springs used in back spring assemblies.



The next step in the spring-making process is the application of a rustproof wax coating which is applied by dipping the baskets of compressed heat treated springs into a hot wax solution. After draining, these springs are dried in an oven and packed in cartons for shipping.

(Continued on page 124)

Fig. 12. A close-up of the final back spring checking template of Figure 11 with a center "M"-shape in position. The other profiles on the template are used for the two additional types of folded springs used in back spring assemblies.



Tool Saving Tips

Use these NEW IMPROVED Inserted Solid Blade KENNAMILLS

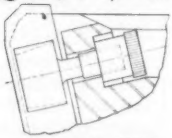
"KF" for STEEL
And Heavy Cast Iron Milling

"KF" radial type Kennamill has solid Kennametal blades. For production jobs on steel, and heavy cuts on cast iron. Standard sizes 6", 8", 10" and 12".

"MF" for CAST IRON

"MF" axial type Kennamill has solid Kennametal blades—more per inch of cutter diameter than the "KF"—for high production runs on cast iron. Standard sizes 6", 8", 10", and 12".

Simplify SET UP, DISMANTLING, MAINTENANCE



NEW! ONE PIECE WEDGE AND SCREW

The shank of the stud-type, heat-treated alloy steel wedge extends through the cutter body. The wedge is pulled down, and blade secured, by turning the Allenut — easily accessible at the back of the cutter.

• These precision-built cutters feature strong, long-lasting, solid Kennametal blades — positioned, supported, and wedged by a new, improved design that assures maximum milling service from each unit of carbide consumed. (See sketch at left.) No threads in the cutter body; possibility of "freezing" eliminated.

Blades can be precision set. Wedges and blades for all sizes of each type cutter are interchangeable. For complete particulars see Catalog 51, and Supplement 2.

KENNAMETAL Inc., Latrobe, Pa.
MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY

Milling Cutters

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Titanium, from page 80

5 Relief) afford nine cubic inches tool life at 40 fmp cutting speed at .009 ipr feed and .062" depth of cut. A water-soluble cutting fluid was used. Carbide tools provide 10 cu. in. tool life at 200 fmp cutting speed. Early laboratory tests indicate that feed should be about .012 ipr. Cast iron grades of carbide appear to give the best results.

One of the important processing operations on titanium is the lathe cleanup of billets prior to all forging and rolling operations. The surface conditions of these billets is poor because of casting pits, slag inclusions, hard particles and contaminated alloy. These surface defects must be removed before billets are processed to avoid distributing the contamination throughout the finished product and to prevent damage to forging and rolling tools.

Some improvement to the surface can be effected by sand or shot blasting, and by etching as much as .008" to .012" if necessary. Some of the worst defects are removed by scarfing or snagging.

Simple turning is the most straightforward metal-cutting operation and the easiest to analyze. For many reasons, it offers the simplest method for comparing machining properties of different materials. Quantitative machinability test work on titanium alloys of the magnitude and scope of the steel tests in Section Two is just beginning.

How STAR-DUST
helped make the famous
Proximity Fuse
a reality . . .
The top-secret Proximity Fuse had bogged down in the production stage. A microscopic burr on the escapement lever was serious enough to result in delayed explosion... defied every effort to remove it effectively. That was when Ace Abrasives engineers were asked for recommendations.
In 24 hours 'round the clock Ace licked the problem. How? By using laboratory-graded STAR-DUST and a special tumbling procedure that proved almost as revolutionary as the new fuse itself.
Accurately crushed and graded STAR-DUST, result of years of experience in this specialized field, will produce mirror finishes for you on tools, dies, molds and precision parts in a matter of minutes.
Be "Laps Ahead" with STAR-DUST. Deliveries are remarkably good. Outline your problems to us, and write for bulletin No. C-2
Star Dust
DIAMOND LAPPING COMPOUNDS
AND DIAMOND POWDERS
ACE ABRASIVE LABORATORIES
250 WEST 57th STREET
NEW YORK 19, N. Y.

Milling

Other machining operations, although basically similar to turning, are vastly more complicated. Comparative test findings on milling drilling and all the others immediately introduce an array of additional variables. Factors such as cutter diameter, number of teeth or flutes and helix angle, to mention a few, make the analysis more difficult. Comparative information may be misleading, therefore, unless tests are conducted under identical conditions.

The presently available data on milling and drilling are all of a preliminary trial nature to uncover the best course to follow in more detailed test work. A few isolated findings are given. In general, it can be said that titanium alloys can be machined fairly satisfactorily at speeds in the vicinity of 70 fpm.

One company's experiments in milling as of January, 1951 are interesting. They have found

18-4-2 high speed steels about the best of the steel tool materials and cast-alloy cobalt-chromium tools superior to carbides. One trouble in carbide milling is that carbide sections tend to flake off due to combined effects of intermittent cutting and the "welding" of chips to tool face. Axial-flow compressor blades are being made from Ti-150A as a possible substitute for AISI 410 stainless steel. Data on this operation follow.

With Tantung side and end mills operating at about 90 fpm (4" diameter, 75 rpm), tool life is about 150 pieces per cutter grind. With Vasco Supreme (18-4-1) high speed steel end mills, the ends of 1¼"x1½" bars are milled square to length at about 50 fpm (2¼" cutter diameter, 92 rpm) with a ⅛" depth of cut and 1" per minute table feed. Tool life is about 120 pieces between grinds (about 25 cubic inches metal removal).

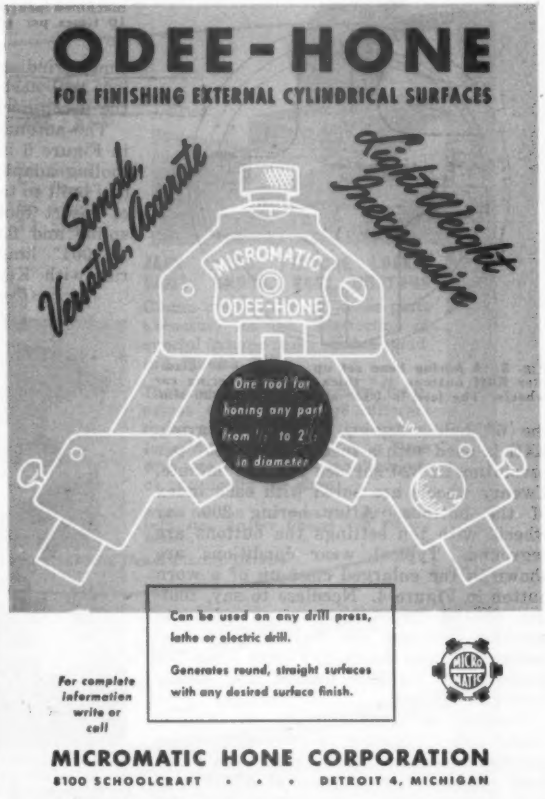
Cut-Off Operations

Reports on sawing titanium vary from "difficult" to "almost impossible." Band sawing seems to be out; the Motch and Merryweather saw seems to work with fair success; and certain types of hacksaws give promise. Abrasive sawing is the best bet at the moment, provided however that proper equipment is used.

In abrasive sawing titanium, it is impossible to plunge straight through a large piece. The wheel must cut successive overlapping shallow scallops, keeping the area of wheel contact as small as possible at all times and giving the coolant the maximum access. If possible, the work should be slowly rotated or indexed so the wheel can cut toward the center and never have to cut more than halfway through. Machines having a wheelhead capable of oscillating as well as plunging motion are ideal. Titanium's poor heat conductivity requires the maximum flow of coolant if heat cracking is to be avoided. That tendency to clog wheels also accentuates the importance of minimizing the wheel-work contact area.

A soluble-oil type coolant is available that kills the objectionable rubber-wheel odor. Seven-inch diameter titanium bars have been cut, rotating the work and oscillating the wheel, in ten minutes (about 14.2 seconds per square inch). A one-inch bar is cut in four seconds.

(Continued on page 116)


ODEE-HONE
FOR FINISHING EXTERNAL CYLINDRICAL SURFACES
Simple, Versatile, Accurate
Light Weight Inexpensive
MICROMATIC
ODEE-HONE
One tool for honing any part from ½" to 2½" in diameter
Can be used on any drill press, lathe or electric drill.
Generates round, straight surfaces with any desired surface finish.
For complete information write or call
MICROMATIC HONE CORPORATION
8100 SCHOOLCRAFT • • • DETROIT 4, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Carbide Trends, from page 74

was preloaded with a brazing strain caused by the difference in thermal expansion between the steel and carbide as illustrated in Figure 2.

These inherent limitations of brazed tools have led to a variety of insert type tools designed for all fields of production machining.

Another good example from steel wheel manufacture is the first boring operation on a car wheel forging. Here four 1" diameter buttons ½" thick are bolted on a boring head and are set to cut in steps as illustrated in Figure 3. Eccentricity of the rough pierced hole causes as much as a full inch of stock to fall on one side of

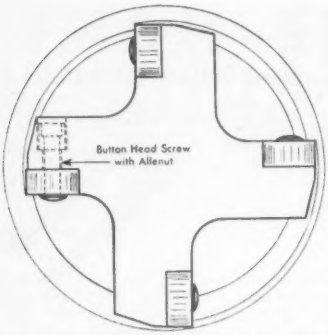


Fig. 3. A boring head set up with four 1" diameter K4H buttons ½" thick used for boring car wheels. The feed is .033" and the speed 320 sfm.

the 6" hole. Again, Kennametal grade K4H is used with a feed rate of .033" per revolution at 320 surface feet per minute. Twenty wheels are bored with each index of the buttons. After boring 200 car wheels with ten settings the buttons are reground. Typical wear conditions are shown in the enlarged close-up of a worn button in Figure 4. Needless to say, tooling of this type requires an adequate machine tool and the Snyder car wheel boring machine shown in Figure 5 has the power and rigidity needed for heavy boring.

Smaller indexable inserts in square, round and triangular cross-sections have become standard single point tools for high production machining of automotive and similar parts. The savings in setup

Fig. 4. A boring head button after being used for machining car wheels. Twenty wheels were machined per index and the button was indexed 10 times per grind.

time, grinding, accuracy of machining and low tool cost per piece have accelerated the acceptance of this type of tool.

The automotive rear axle tooling shown in Figure 6 is another example of modern tooling adapted to a heavy duty machine tool built to take advantage of the capacity of insert tools. The ability to maintain spline and flange diameters within .002" to .004" limits throughout a production run with Kennamatic insert tools, elim-

(Continued on page 118)

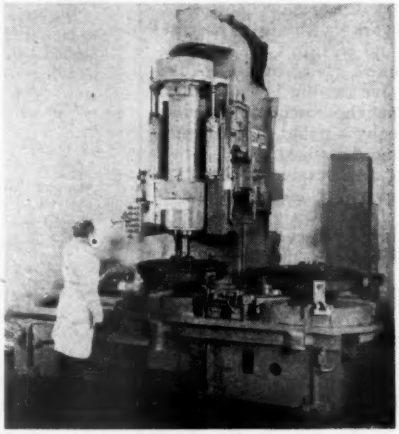
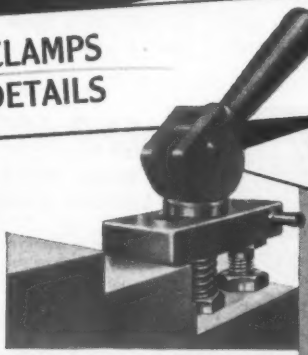


Fig. 5. Boring rough pierced holes in car wheels on a Snyder car wheel boring machine. Boring head tooled with K4H buttons and using a .033" feed and speed of 320 sfm.

OVER FORTY YEARS OF FINE TOOLS

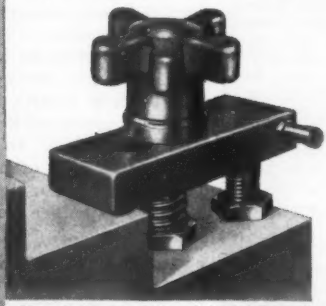
SIEWEK

FIXTURE CLAMPS
FIXTURE DETAILS



STANDARDIZE AND ECONOMIZE "SIEWEK" IS THE ORIGINATOR OF STANDARD CLAMPS AND DETAILS.

Drill Jigs	161 Sizes
Fixture Clamps	73 Sizes
Fixture Details	156 Sizes
Fixture Locks	12 Sizes



JACK LOCKS, FIXTURE LOCKS, CAMS, KNOBS, REST BUTTONS

Clamp assemblies and other parts necessary for the construction of special fixtures make up this standard Siewek line.

These Clamp assemblies themselves are made in 36 different types, most of them in three sizes. In other words, there is a type and size to meet the requirements of practically all shops.

Write for full size template sheets for Drill Jigs, Fixture Clamps and Fixture Details.

ALSO Manufacturers of Siewek Rapid Clamping Jigs & Fixture Details

Siewek TOOL COMPANY

2862 East Grand Boulevard, Detroit, Michigan
BRANCH OFFICE: CHICAGO — Siewek Tool Co., 224 S. Michigan Ave. Wabash 5500, Chicago 4, Illinois

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Titanium, from page 113

Considerable promise is shown in the abrasive cutting of titanium at lower wheel speeds. Three to four thousand fpm wheel speeds (instead of the usual five to six thousand) have been tried with good results; at these speeds wheel wear is reduced appreciably.

With hacksawing, constructive recommendations indicate an extremely coarse saw (two to four teeth per inch), slow speeds and heavy feeds. Ordinary fine-toothed saws and conventional feeds result in extremely small feeds-per-tooth. With titanium, this results in rapid work hardening which makes further cutting extremely difficult.

Drilling and Tapping

All machining operations on titanium alloys require the observance of this rule: because of the rapid and extreme work hardening tendency, do not disengage feed while tool is in moving contact with work. This is particularly true in drilling. For the same reason, pilot holes are "out" and the enlarging of holes is to be avoided. Poor thermal conductivity and a strong "pick up" or "welding" tendency are two more properties of titanium which require special techniques, and the tough, non-curling type of chip further complicates the picture in drilling and tapping because of the space restrictions.

Eccentric drilling, using high-cobalt drills with notched lips, and slow speeds and about double the feed common with steels offers promise of giving improved results. (Next smaller size drill, point ground off center, runs out, drilling a larger hole.) This minimizes rubbing and reduces pick-up and heating.

The notched lip idea in drilling when carried over to tapping results in use of staggered-tooth taps, which also tends to break up chips. Use of a 60% thread and a tapping speed of 12-15 fpm are also recommended.

Lockheed Tests Titanium Alloys

Extensive preliminary tests on the 5% chromium, 3% aluminum alloys have been made. Selected data on the development of turning and milling techniques are included here.

Turning tests were run with carbides of several makes, cast-alloy materials and high speed steel. Of the carbide tool tests,

ALL THIS
AND MORE
WITH CHALLENGE
LAYOUT SURFACE PLATES
PRECISION
RIGID STAND
UNIT DESIGN
Built of fine-grade special analysis semi-steel . . . these plates provide a smooth accurate surface for layout, inspection or assembly work. Six inches thick, 16 standard sizes — 8" thickness and other sizes to order; also special plates with "Tee-Slots" or grooving, scoring, machining as specified. Arc-welded, all-steel stand is equipped with lock leveling screws. Plates can be grooved and keyed so that two or more may be assembled into one complete unit, e.g., four 54 x 144" plates into one 108 x 288" unit. Write for data and prices at once!
671
Challenge
THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICHIGAN
Send for Illustrated Catalog

the information on Kennametal is the most complete but its inclusion is not intended to imply any exclusive preference.

Styles AR 10, BR 10 and D10, and modified versions of these tools were used, all having the same tool angles as used in the steel tests in Section Two (O BR, 6 SR, O SCEA, 6 ECEA, 6 Relief). Lockheed's tool-life technique is to cut a predetermined quantity of metal (measured in square inches of machined surface) with each tool under identical conditions, then study the wearland or extent of breakdown. The four initial tests were made using a feed of .010 ipr, a depth of cut of .030", and 35 fpm cutting speed. Oil was used as a cutting fluid and 55 square inches of surface were machined. (This is equivalent to 5.5 cu. in. at .100" depth of cut.)

K3H, a steel-cutting grade, K6, a hard, cast-iron grade, K2S, a cast-steel grade, and KM, a general-purpose grade, were tried. (See manufacturer's catalog for more exact description.) Both the K6 and K2S tools performed successfully, exhibiting practically no wear for the 55 sq. in. cut. K3H showed medium tool wear, considered as excessive; the KM tool wore about the same.

On the strength of these findings, K6 was again tried, this time at .020 ipr feed, .060" depth of cut and 100 fpm cutting speed. The tool was permitted to cut 95 sq. in. of surface in which time the tool had cratered badly. (With double the feed and almost three times the speed of the previous test, the machining rate here was six times that of the earlier run in terms of square inches, and twelve times in terms of cubic inches, as the depth of cut was also doubled. The number of square inches machined increased from 55 to 95; therefore, the cutting time for the second test was approximately one-third that of the first test.)

A finished cut was then made, again using K6 carbide. Feed was set back at .010 ipr, and depth of cut was made very shallow, only .0025". Speed, however, was increased slightly to 120 fpm, and 140 sq. in. of surface were machined. Wear was very slight and results were considered satisfactory. Finish in all tests but the heavy feed run was good: about 100 micro-inches.

Milling

Milling tests were performed on a Kearney & Trecker No. 2 horizontal milling

(Continued on page 126)

Finer Finishes Faster!
ELGIN DIAMOND
in DYMO Diamond Compound
Pure, virgin diamond in an exclusive field-proved vehicle gives you maximum cutting speed. Certification to Bureau of Standards requirements is your assurance of dependable, predictable results. Write for free demonstration.
ABRASIVES DIVISION
ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Lapping Compound! Diamond

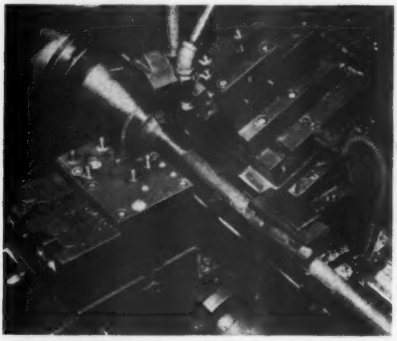
. . . Carbide Trends, from page 114

inated the costly grinding operations formerly necessary on this part.

Contouring attachments and tracing devices on semi-automatic lathes are today saving many manhours in duplicating parts where turning, facing and even boring operations are involved. This method of machining, whether the contour is of a simple modified cylindrical shape or a more intricate form, is usually accomplished with a single tool. Carbide tools cutting at higher speeds and feeds are a **must** where a single tool must traverse the entire cut.

Triangular shaped inserts, buttons, cylinders and other inserts have again proved superior to brazed tools on these operations demanding maximum tool performance. In one small shop operating three Monarch tracer lathes, speeds as high as 1200 surface feet per minute on alloy steel aircraft forgings using Kennametal grade K5H in solid square inserts give a maximum output with a reasonable tool life. In Figure 7 a shaft is being contour machined with a Kennamatic triangular insert on a Lodge & Shipley Copymatic lathe, an ideal spot for triangular inserts.

Fig. 6. A typical application of the insert type of tools on a modern high production lathe is shown in the machining of automotive axles.



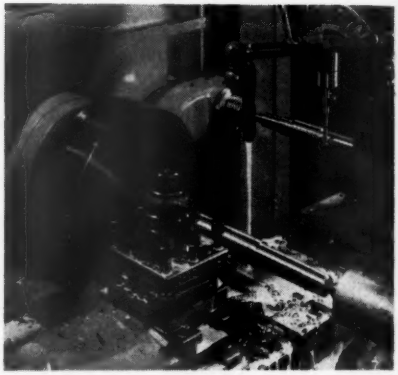


Fig. 7. Contouring on a Lodge & Shipley Copymatic, another application for solid carbide insert type tools.

Modern machine tools are built with adequate horsepower, rigidity, spindle speed ranges and capacity to take full advantage of cemented carbide cutting materials. Carbide tool designers have realized the need for tool designs more rugged than the early brazed tools. Heavy heat-treated alloy steel tool holders with removable inserts have been the answer. The field for ingenious design of rugged holders, clamping devices and shapes of carbide inserts is unlimited. The applications cited above are typical of a few proved types of insert tools.

★ ★ ★ ★ ★

Army Subcontractor Survey

Eight prime contracts covering certain technical items purchased by the Army were selected for a recent survey and the prime contractors were requested to report on their subcontracting activities under these contracts. The Army Audit Agency obtained similar information on five additional contracts. As a result of this survey, which involved contracts amounting to approximately $900 million, it was found that 42% of the money found its way into the hands of small business through subcontracting.

Another clue to the extent of small business participation in Government work is the annual report of General Services Administration which points out that small business supplies approximately one-third of all Federal civilian procurement and that almost the same share is obtained by advertising for bids. The data were compiled from 46 executive agencies for 1951 when they purchased $3.9 billion worth of goods and services. For all other civilian agencies activities, the small business share approached 50% and advertised purchases came to almost 75%.

RELENTLESS PRODUCTION SCHEDULES
and
SMALL PRECISION GEARS

•

FEELING FUTILE?

Unusual conditions are usual now. You are *expected* to build small, precision mechanisms on fast production schedules. And you will be expected to produce them better and faster tomorrow. But why worry? All you will need will be better machines.

MORALE BOOSTER

And better machines are here *now!* The Hamilton No. I Precision Small Gear Hobber will *solve* your problem in respect to gears. All gears, regardless of shape, if they are small and exact, can be produced faster on the Hamilton No. I.

FREE HELP

You don't expect full information about such a machine in the small space of one advertisement. But full information is available . . . ten printed pages of it . . . and offered to you free, Write for our Bulletin No. H-492, with supplement. Do it now . . . tomorrow you may need to *know!*

THE Hamilton TOOL COMPANY
832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

Gear Hobber

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Why not get more carbide

It's easy to get spectacular Carboloy Cemented Carbide performance in a wider range of blanking, drawing, forming and piercing dies with up-to-the-minute Carboloy helps for carbide applications, die designs.

FIELD ENGINEERING—At your call, a Carboloy Field Engineer will drop around to your plant . . . ready with on-the-spot answers to your press die problems. Call him. He's a carbide expert who will advise you on proper application of carbides to your press dies.

Do you manufacture or use press dies? Simple or complex, for any blanking, drawing, forming or piercing operation?

Why not explore the full possibility of applying Carboloy Cemented Carbides to those dies . . . and get increased production, less down-time and maintenance, fewer rejects, longer die life and all the other benefits that *only* carbides can give you?

Complete Carboloy Die Services, available *free*, can help you make the design and application of carbides to your dies an easy job. And high-quality Carboloy Cemented Carbide is just the metal you'll need to do the job right.

Check the services outlined on these pages. Then contact a Carboloy representative first chance you get, or mail coupon.

DIE TRAINING SCHOOL—Here is practical carbide training your tool room employees won't want to miss. Tuition-free. Features specialized courses in the finishing and servicing of carbide dies to increase die life, assure top performance. Located in Detroit.

TECHNICAL DATA—Free, all-inclusive technical literature is another Carboloy Die Service. The Die Engineering Manual, shown here, can be a handy guide to help you design, apply, use and maintain carbide dies. Send coupon for your copy right away.

Visit the Carboloy Exhibit Booth No. 539 at the A.S.T.E. CONVENTION Chicago, March 17-20

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

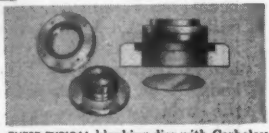
11111 E. 8 Mile Ave., Detroit 32, Mich.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

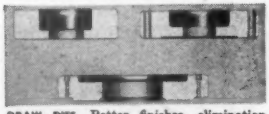
benefits from your press dies?

LAMINATION DIE complete with guided, spring-type stripper is an example of the more complex dies where Carboloy Cemented Carbides can be easily applied. The parts illustrated above in black are applications of Carboloy Cemented Carbide, located at the spots where wear would occur quickly if carbides were not used. The carbide parts used here will wear up to 20 times as long as tool-steel. They are finished to fit in everyday tool-room fashion by using correct type of grinding wheels. Carboloy engineers will be glad to help you design and apply carbide to every possible die of this type.

COMPACTING DIE and punches for piercing highly abrasive materials are other examples of the types of carbide dies widely used throughout industry. The uniform, high-quality Carboloy Cemented Carbide in these and other dies for almost any production job will boost production, lower costs, and bring you bigger profits wherever used.



THESE TYPICAL blanking dies with Carboloy nibs in the die and punch produce up to 1 million circular laminations per grind. Steel dies did only 50,000. Simple dies of this type can be readily designed and built for you by the Carboloy organization to your specifications.



DRAW DIES. Better finishes, elimination of polishing and longer die life are some of the benefits that Carboloy Cemented Carbides provide in these drawing dies that produce stainless kitchenware. You can apply carbide like this right in your own tool room, or have it done at the Carboloy plant.

Clip and send today . . . for information on carbide dies.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11111 E. 8 Mile Ave., Detroit 32, Mich.

We are interested in your dies and services, and what they can do for us. Please send without cost or obligation the material or information checked below.

☐ **Die Training School Information**

☐ **Die Engineering Manual D-124**

Name_____ Position_____

Company_____ Address_____

City_____ Zone_____ State_____

Carbide Dies

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Small Lots, from page 67

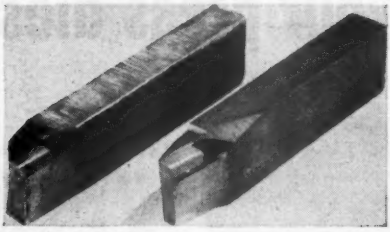


Fig. 3. The cutter on the left is one of the standard styles and the shank is high tensile cast iron. The lead angle cutter on the right was made after only a few milling operations were performed on a cast shank of the same style as the first.

be taken into account.

A typical example of how time and money have been saved with carbides is the multiple cutter we used for rough boring main spindle bores in turret lathe beds (see Figure 4). The tool was originally of solid high speed steel and once it had been used and ground undersize, it had no reclaim value. Today we make the body of an alloy steel to which is brazed the carbide tips. Now when we lose length between steps, instead of throwing the body aw v as we did before, we build it up with weld and rework and braze on new tips with the result that we have a very inexpensive replacement.

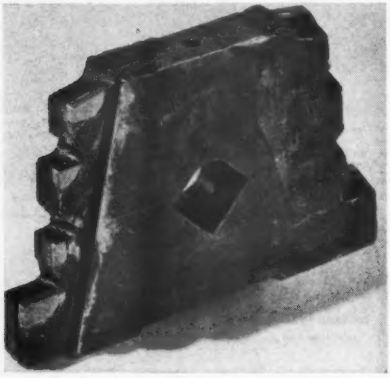


Fig. 4. Carbide boring tool formerly made of high speed steel. Notice how the body of this cutter has been built up so that a second set of blades could be used.

On this particular example we save better than 50% machining time and it is obvious that our cutter cost has been greatly reduced.

We have also been very successful in the use of carbides on planers, and whereever possible our cast iron is machined in speeds of from 185 to 250 feet per minute. A note of caution might be inserted regarding this application; we do not attempt to take heavy cuts, but instead limit ourselves to ⅜" depth of cut and .060 feed. This fills our needs and is nearly double depth and feed rate that was formerly used with high speed steel cutters. Other shops might be able to use carbides to an even greater advantage, but we are limited by the nature of the work.

Some of the various types of planer cutters are illustrated in Figure 5, such as roughing, flat finish, side roughing,

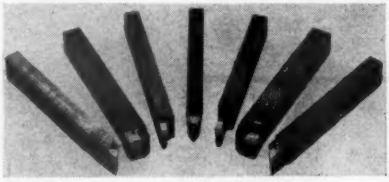


Fig. 5. Because of the large amount of "overhang" usually required in planning operations, these tools have steel shanks instead of cast iron.

dovetails, etc. Further savings are effected by these cutters since the finish is so much superior to that formerly obtained that the amount of scraping that is necessary in assembly has been drastically reduced.

Turret lathe applications are a pleasure to work with and examples of time saving and better quality are so numerous it would be very difficult to sum the results into a small space. However, here are a few typical applications.

On our cross slide screws, using standard Warner & Swasey tooling, we had a saving of better than 75% in cutting time alone.

In trepanning chuck bodies we take approximately 1½" depth of cut with a double cutter (see Figure 6). On this particular job we cannot make a comparison

(Continued on page 134)

$2250 in Prizes for Papers on Resistance Welding

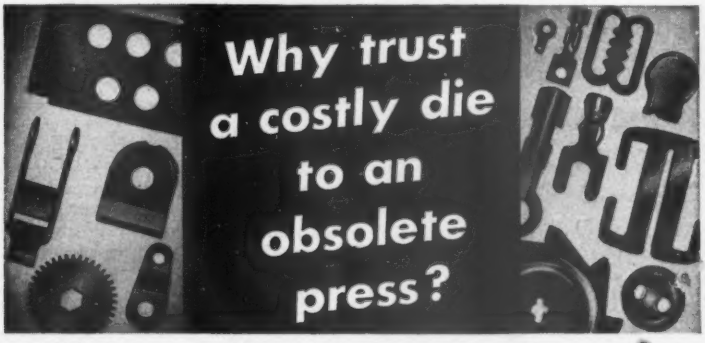
Cash prizes totaling $2250 will be awarded this year by the Resistance Welder Manufacturers' Association for outstanding papers dealing with resistance welding subjects. A wide choice in subject matter is allowed to assure eligibility to all papers that cover worthwhile achievements in the field.

First and second prizes are $750 and $500, respectively. The contest is open to anyone, without restriction, from the United States, its possessions and Canada. It is also open to any member of the American Welding Society in any grade from any place in the world. Deadline is July 31, 1952.

The contest judges will be appointed by the American Welding Society, and awards will be made at the 1952 Fall meeting of the Society.

A complete list of prizes and contest rules can be had by writing to the Resistance Welder Manufacturers' Association, 1900 Arch St., Philadelphia 3, Pa.

While each prize award is the total for the paper, each individual author and co-author, if any, will be presented with a suitable certificate.

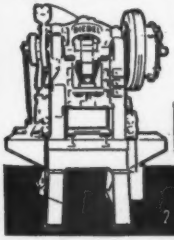


If this is your problem—isn't it important to be assured of top-flight press and die experience behind every stamping job you plan?

INCREASED PROFITS!

Correct press and die engineering will increase your stamping output, reduce your down time, and give your die longer life.

Let DIEBEL engineers with 30 years of specialized training help you make every automatic press outlay more profitable.



5-8-12 Ton Di-Masters
40 Ton Di-Matic

DIEBEL HI-PRODUCTION AUTOMATIC **PRESSES**

Di Machine Corp.

2708 W IRVING PARK ROAD • CHICAGO 18, ILL

For a guide to important savings, write on your letterhead for a new booklet, "Cost Savings thru Precision Stamping"

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Quality Control, from page 110

Occasionally there are instances where individual back springs are loosened from their compressed shape either before they are heat treated or after heat treatment while they are being handled for shipping. When this occurs before heat treatment, the spring is defective from a dimension standpoint and would be rejected. Where the loosening occurs after heat treatment and if the spring gets into a carton, it creates a difficult handling problem because the loose spring becomes entangled with the many other springs in the carton.

To prevent springs which have loosened before heat treatment or after heat treatment from reaching our customers, a quality procedure has been set up in the Shipping Department and random samples of packed cartons are opened, each shift, in sufficient numbers to bring the number of open springs shipped to the practical minimum.

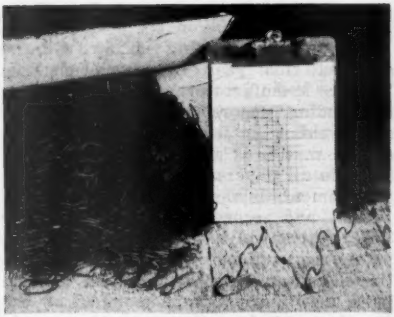


Fig. 13. If a spring becomes loosened from its compressed shape after heat treatment and after the spring gets into a carton, a difficult handling and untangling problem is created.

Figure 13 shows an open carton with an example of one spring opened before heat treatment and another spring accidentally opened after heat treatment. The number of incidents of this kind in each sample are recorded on an "np" chart and control limits are established. Whenever the limits are crossed, corrective action is taken. The "np" chart used is also shown in Figure 13.

The foregoing covers in general Statistical Quality Control applied to back springs. Similar inspection problems are encountered on the seat springs and with the assistance of the next few pictures the quality control and inspection of seat

(Continued on page 132)

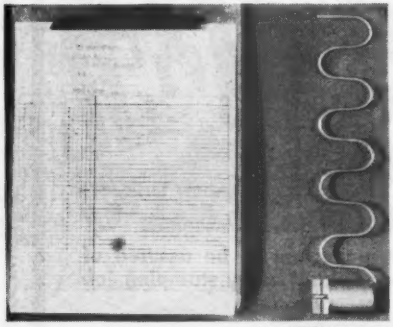


Fig. 14. (above) This shows the gauge for inspecting the straightened ends. This is done by a random sampling of twenty springs every half hour. Results are recorded on the chart. Only 1.5% or less of these springs run out of gauge limits.

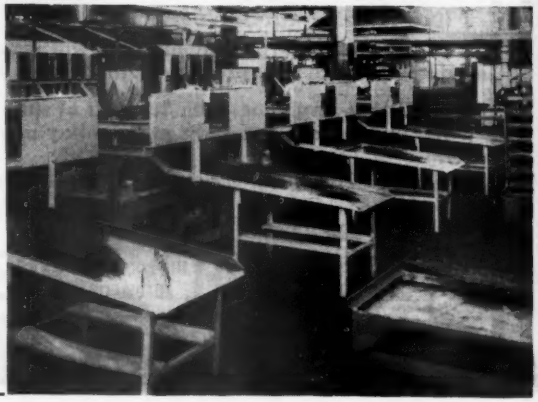


Fig. 15. (right) After end straightening operations the main seat spring strips go through the automatic seat spring folding machines. Quality Control is emphasized in this critical operation of correct forming.

CUT CARBIDES *fast..*

VIA

THOMAS METALMASTER

Cut Any Size or Any Shape Hole in Carboloy (or *Any* Cemented Carbide)

MODEL 952

Yes, now you can cut cemented carbides in a matter of minutes . . . or seconds if you prefer.

The THOMAS METALMASTER DISINTEGRATOR will cut ¼" thick Carboloy in 5 minutes . . . ¼" thick Stellite in 60 seconds. The THOMAS METALMASTER will remove a ¼" broken tap ½" long in only 3 minutes. Think of it . . . think of the savings in time . . . the savings in workpieces that would normally go for scrap . . . think of the production increase . . . the profit rise per man per hour. Think of cutting any size hole of any shape desired . . . PLUS the fact that the temper of the workpiece is not in any way affected.

REPORTED: the world's largest manufacturer of Cash Registers saves over $70,000.00 annually in Tool and DIE repair alone with only TWO METALMASTERS in their plant.

REPORTED: terrific drop in scrap loss per man from $35.00 per man to $8.00 per man with the use of 14 THOMAS METALMASTERS in the world's largest Aircraft Engine Manufacturing Plant.

For Technical Information relative to metal disintegration via the TM way send for your copy of the Thomas Metalmaster Technical Bulletin published monthly in the interest of metal disintegration advancement. This is the ONLY source on metal disintegration available in the world. Direct reports monthly from our own complete research laboratories.

Write today on your company letterhead to:

WARNER DIVISION OF CLINTON MACHINE COMPANY

21535 GROESBECK HWY. • DETROIT 5, MICHIGAN

There's a factory trained representative in your area ready to give a free demonstration in your own plant to show you how you too can do what thousands are doing to increase profits and cut down on loss.

Metal Disintegrator

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Titanium, from page 117

machine, using both carbide and high speed steel cutters. Cutting speeds from 20 to 720 fmp and feeds from .004" to .016" per tooth were tried:

With a 4" diameter, 4-tooth KM carbide-tipped end mill having 6° negative axial rake and approximately 6° positive radial rake and a 6½° clearance angle, tests were run under various conditions. At 21 Fpm, cuts were taken at .006" and .008" feed per tooth using lard oil. In both cases the tool dulled rather quickly. A later test was run with the same cutter on titanium, using no cutting fluid, at 46 fpm and .008" feed per tooth. In this case, the tool cut well for a short time, followed by extreme heating and rapid breakdown.

High speed steel side milling cutters, plain and chromium plated, were also tried, at speeds from 27 to 31 fpm and feeds of .004"—.005" per tooth with poor results. The chromium-plated tool broke down very quickly while the plain cutter having a slightly lower radial rake and less axial rake lasted for 2 sq. in. before losing its edge. Tests were then performed with a 6" diameter, 6-tooth Carboloy-tipped side milling cutter having 2½° negative radial rake and 6° negative axial rake. The titanium test piece was submerged in a bath of dry ice and triethyl phosphate resulting in a temperature of —100° F. With this setup, speeds from 31 to 69 Fpm at feeds of .005" to .008" per tooth produced no tool wear. At 30 Fpm and .016" per tooth, wear was slight. At 89 Fpm and .018" per tooth wear was also slight. (In both cases, the finish was coarse). Tests were also run at 118, 151 and 195 Fpm and feeds of .0045", .0015" and .008" per tooth, respectively, and the results were progressively poorer. A test was made at 720 Fpm in which the tool was badly damaged. Cutting time in these tests was not stated.

Apprentice Training in Critical Trades is increasing, according to recent reports by the U. S. Labor Department's Bureau of Apprenticeship. There has been a noticeable trend in the development of the much needed craftsmen in the skilled trades listed as critical in four of the trades where there has been the greatest need for them—machinists, tool and die making, molder and coremaking and patternmaking. During the five months from June 1 to November 1 there was a 12 per cent gain in the number of registered apprentices in these trades—from 11,357 to 12,696.

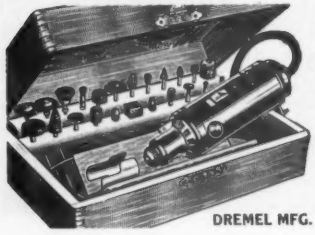
SPEEDS UP TOOL ROOM AND PRODUCTION LINE OPERATIONS

DREMEL *Electric* MOTO-TOOLS

MOTO-TOOL No. 2, with one emery wheel point..... $16.50

MOTO-TOOL KIT No. 2, with accessories, (high-speed steel cutters) and Model 2 Moto-Tool in natural finish hardwood case $23.50

APPROX. 27,000 R.P.M.



Dremel Moto-Tools, widely used in industry for over 15 years, are World War II Veterans — served in defense plants and military maintenance bases everywhere. Hundreds of operations—polishing and grinding dies, burring parts, sharpening cutters, etc.—performed in seconds *without tearing down "setups"*. Moto-Tool is sturdily constructed for continuous duty. Weighs only 13 oz. —approx. 27,000 r.p.m.—dynamically balanced for vibrationless operation.

WRITE FOR INDUSTRIAL CATALOG

DREMEL MFG. CO. Dept. 522-B RACINE, WIS.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Hand Tools: Electric

More Machine Tools Not Enough, Study Reveals

All-out production of machine tools alone will not be sufficient to enable the nation's industries to tool for the dual job of providing both military and economic security. This consensus of industry has been revealed by Harry E. Conrad, Executive Secretary of the American Society of Tool Engineers.

Tabulations of returns from a national study covering most major industries and both large and small companies reveal, Mr. Conrad said, that only 7% of companies queried believe that all-out production of machine tools and other production equipment will solve our "tooling for security" problems.

In general, the returns indicate, industry puts the need for better machine tools far ahead of availability of more machines, Mr. Conrad added. Ninety-four per cent of all companies stated that development of better equipment was necessary. Some of the companies apparently believe this so strongly that almost one out of every three asked for an all-out program of development—right now—on better manufacturing equipment, Mr. Conrad said.

"The findings of our study definitely do not mean that industry is opposed to all-out production of machine tools," the A.S.T.E. official pointed out. "Rather it indicates that the men in industry who should know—the nation's production know-how engineers — recognize that more machine tools is not an adequate answer. They are almost unanimous in demanding that the producers of all kinds of manufacturing equipment should devote some time and effort right now to the development of . . . . better equipment.

"Apparently American industry is looking far ahead of the momentary problem," Mr. Conrad stated. "Much more so than we would have anticipated, considering the enormous emphasis now being given to the immediate need for more machines and tools to get production rolling."

The study was undertaken by the A.S.T.E. primarily to determine the best type of technical program for the Industrial Exposition in Chicago in March. "The findings are potentially so important . . . . that we have decided to make the information generally available," Mr. Conrad explained.

More Lathe Output

PER MAN-HOUR!
PER MACHINE!

Easy with
IDEAL Live Centers
for light or heavy turning

Make deeper cuts at faster speeds . . . No gouging or burning . . . No spoilage or rework . . . Precision-built for micrometer accuracy. "Multi-Duty" Models available with male, female and pipe points. "Heavy-Duty" Models for BIG jobs. All standard sizes.

Mail— FOR FULL DETAILS

IDEAL INDUSTRIES, Inc. (IDEAL)
4151 Park Avenue, Sycamore, Illinois
Please rush catalog information on IDEAL Live Centers
NAME
COMPANY
ADDRESS
CITY ZONE STATE

Circle postage-free Inform-A-Gram Key Number for your request.

"Meehanite Dies for the Stamping Industry" is an excellent guide for all manufacturers who purchase and/or make dies for stampings. This 20-page booklet, published by Fulton Foundry & Machine Co., Inc., contains complete factual information, accompanied by sectional drawings and many photographs showing the uses and economies of Meehanite Dies. There is a table giving the physical and engineering properties of Meehanite Metal in the "as cast" condition. FULTON FOUNDRY & MACHINE CO., INC., E. 75th & Morgan Ave., Cleveland 27, Ohio, will honor your request.
Circle Inform-A-Gram No. C1.

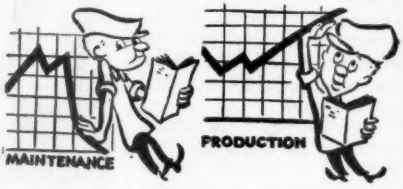
The Handy Cleveland Production Tapping Guide gives figures, data and other information designed to assist the estimator, setup man and operator in employing production tapping to the best advantage. There are 24 pages of suggested tapping speeds, a tap trouble check chart, thread elements and tap drill sizes, a conversion table, etc. Write to THE CLEVELAND TAPPING MACHINE CO., A Subsidiary of Automatic Steel Products, Inc., Dept. T&P, Canton 6, Ohio.
Circle Inform-A-Gram No. C2.

"Metal Stitching—A New Technique in Fastening" is a 12-page, two-color booklet from Acme Steel Co. that describes the technique, advantages and limitations of the metal-stitching method. Several pages of line drawings, eight application photographs and much tabular stitching-wire data are included. The booklet also contains a two-page spread of eight photo-illustrated user case histories. Write for a copy to ACME STEEL CO., 2840 Archer Ave., Chicago 8, Ill.
Circle Inform-A-Gram No. C3.

Kennametal's Clamped Tool Design Manual is intended to assist the user in making his own special-purpose clamped carbide tools. It illustrates special clamped tools and modifications of standard designs that have proved satisfactory in actual operation. Copies of this useful, 16-page booklet can be obtained by writing KENNAMENTAL INC., 500 Lloyd Ave., Latrobe, Pa.
Circle Inform-A-Gram No. C4.

Data-Filled Calendar. Standard Tool Co. offers a 1952 calendar which provides many pages of useful technical data, in addition to serving its primary purpose. There are 22 pages of information on such subjects as commercial tolerances for taps, cutting speeds, drills and their proper uses, drill selection for specific jobs, involute gear cutters, sizing and cutting of gears, speeds and feeds, Morse taper shanks, suggested speeds and feeds for drills, and tap drill sizes. Send for a copy to STANDARD TOOL CO., Dept. T&P, 3950 Chester Ave., Cleveland 14, Ohio.
Circle Inform-A-Gram No. C5.

"Maintenance Guide for Electric Heat Treating Furnaces," published by Hevi Duty Electric Co., is intended to be of value in pushing your furnace maintenance down and holding your production up. A handy check sheet is included to simplify maintenance schedules, reduce breakdowns and prolong furnace life.

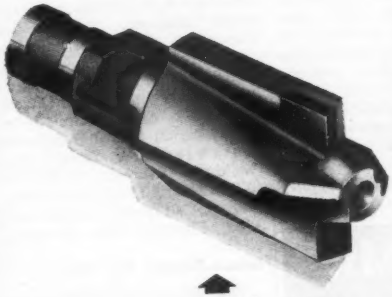


Copies are available upon request to HEVI DUTY ELECTRIC CO., Dept. T&P, 231 W. Michigan St., Milwaukee 1, Wis.
Circle Inform-A-Gram No. C6.

"The Theory of the Microscope," written by James R. Benford, Bausch & Lomb, is a 24-page, non-mathematical exposition of how a microscope works, with some notes on conditions that influence optical performance. Objectives, eyepieces, condensers, filters and types of illumination are treated in a non-technical manner. It is available in limited quantities as a threshold to a wider study of this universally used instrument. BAUSCH & LOMB OPTICAL CO., Dept. FF-1, Bureau of Education, Rochester 2, N. Y.
Circle Inform-A-Gram No. C7.

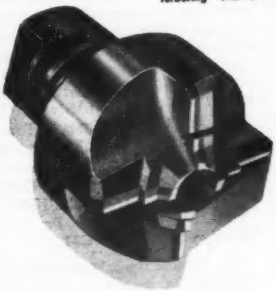
PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Take a Tip FROM US...

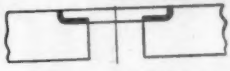


A common application in counterboring—chamfers and faces.

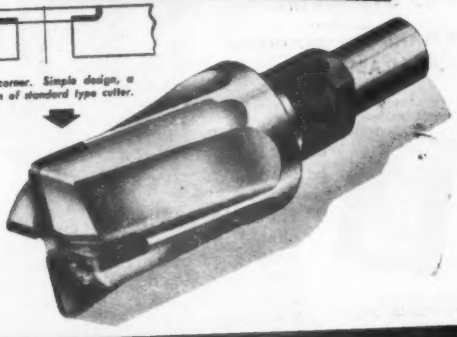
Just try the rugged Eclipse carbide tipped tools and you'll never settle for less. Thousands of them are in daily use in production machining of steel, iron, brass, aluminum and other materials cast and forged. Eclipse engineering experience is available at all times. Send your production problems to us. . . . better yet, drop in to see our complete line at the ASTE Exposition—Booth 526.



Used in machining aluminum alloy. Finishes five surfaces.



Radius corner. Simple design, a variation of standard type cutter.



ECLIPSE COUNTERBORE CO.
Founded in 1913
DETROIT 20, MICHIGAN

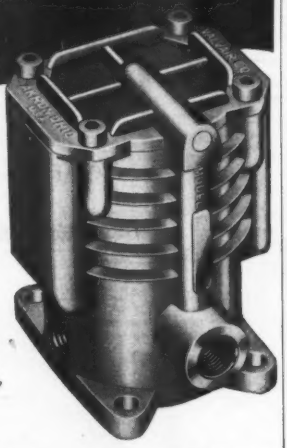
Counterbores

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

"Anaconda Welding Rods and Procedures," a 24-page booklet, is now available in a new edition. Applications and procedures are suggested for production and repair welding, and for building up worn surfaces with bronze rods. Welding techniques discussed include the oxy-acetylene torch, metal-arc, carbon-arc and inert-gas-shielded arc. Navy and Federal Specifications are listed. Copies of the booklet, designated Publication B-13, are procurable from THE AMERICAN BRASS CO., Dept. T&P, Waterbury 20, Conn.
Inform-A-Gram No. C8.

A New Bulletin on Punch and Die Care has been published by F. J. Stokes Machine Co. The bulletin gives a broad summary of ways and means for keeping punches and dies in condition to do the best work at highest efficiency. Punches and dies are among the smallest parts of any powder compressing machine, yet if they are not in perfect condition, an imperfect, perhaps useless product results. Write to F. J. STOKES MACHINE CO., 5500 Tabor Rd., Philadelphia 20, Pa., and ask for Bulletin No. 610.
Inform-A-Gram No. C9.

The *New* VALVAIR
SOLENOID
PILOT VALVE



All This at a Low Price!

- OVER 20,000,000 CYCLES
- CORROSION-PROOF
- NO OVERHEATING
- MANIFOLD MOUNTING AVAILABLE

SIZE:
¼" pipe tap,
orifice ⅛"
or 3/16".

The NEW Valvair Solenoid Pilot Valve is offered in 2-way and 3-way models, normally open or normally closed. Coils are completely sealed. Only two moving parts: spring and plunger. Valve life is almost unlimited.

Write for our new Bulletin X-2.

VALVAIR CORPORATION, 952 Beardsley Ave., Akron 11, O.
AFFILIATE: SINCLAIR-COLLINS VALVE CO.

Rely Upon Valvair 2-WAY 3-WAY 4-WAY

"Manual of Welding Design and Engineering" is offered by Eutectic in a giant fourth edition. Enlarged to 72 pages, the book contains 62 new photographs and 132 new drawings together with the latest data and how-to-do-it articles. Application drawings, weld diagrams, and tables containing the latest information on melting temperatures, tensile strengths, corrosion factors, charts, etc., are included. The book gives detailed information on over 100 different Eutectic Low Temperature Welding Alloys. EUTECTIC WELDING ALLOYS CORP., Dept. "P", 172nd St. & Northern Blvd., Flushing, New York 58, N. Y.
Inform-A-Gram No. C10.

The Aircraft Fabrication Series consists of 17 specially prepared booklets. This material was originally released during World War II and has been revised after extended research in major aircraft companies. The booklets cover such subjects as "Drop Hammer and Press Brakes," "Bending, Drawing, Rolling and Spinning," "Aircraft Riveting," "Mock-up," "Steel Dies," "Templets," etc. A circular giving the price and subject matter of each booklet can be had from LAUREL PUBLISHERS, Dept. T&P, Scranton 9, Pa.
Inform-A-Gram No. C11.

A Productive Maintenance Slidefilm is being offered by General Electric to augment its recently announced Productive Maintenance Program. The 12-minute, black-and-white, sound film presents a quick, visual report on the main elements of the program. It includes three case histories showing how it is being put to use in industrial plants and reviews and plan's six major recommendations for good maintenance. Arrangements for a showing can be made through any of GENERAL ELECTRIC COMPANY'S aparatus sales offices or service shops.

Valves; Solenoid Pilot

"Why Living Improves" is graphically explained in a colorful wall chart. It was designed by Leighton Wilkie, Managing Director of The Wilkie Foundation, and Chairman of the Board of The DoALL Co., and presents for the first time a graphic explanation of the economic factors affecting the progress of our standard of living. Anyone studying the chart will have an understanding of basic facts pertinent to our economic life, as well as the reasons for our abundant production. Copies of this 17" x 22" chart suitable for wall mounting or for bulletin boards in company plants, schools, etc., are available at 25 cents each. Write THE WILKIE FOUNDATION, 254 N. Laurel Ave., Des Plaines, Ill.

"Production Control Systems and Procedures" is a 56-page, Remington Rand book that details a unique method of materials control that results in a shorter production planning cycle while speeding production by eliminating the causes of varied delays on the production line. The book, fully illustrated with typical forms and procedure charts, outlines complete procedures for engineering, production planning and progress, machine load, material and tool procurement and control. Write REMINGTON RAND INC., 315 Fourth Ave., New York 10, N. Y., and ask for a copy of publication X-1268.

Inform-A-Gram No. C12.

Eyelet Setting Data are contained in an informative booklet issued by Edward Segal, Machinery. The publication tells just what eyelets are, how they should be selected and how they should be used. Eyelet attaching machines and setting tools are also discussed and several helpful drawings are included. The booklet is obtainable upon request to EDWARD SEGAL, MACHINERY, 72 Spring St., New York 12, N. Y.

Inform-A-Gram No. C13.

Use of Hollow Die Steel by an oil seal manufacturer to cut drilling time is described in an interesting magazine reprint obtainable from A. Milne & Co. The article, written by Robert S. McGranahan, Tool Room Foreman, National Motor Bearing Co., Inc., Redwood City, Calif., is well illustrated. The reprint also lists the dimensions and sizes in which Milne Hollow Die Steel is available. A complete list of Milne sales offices and warehouses is included. A. MILNE & CO., 745 Washington St., New York 14, N. Y.

Inform-A-Gram No. C14.

Nickel Cast Irons offer greatly improved physical and mechanical properties and can be produced by any foundry having reasonable control. A bulletin, "Guide to the Selection of Engineering Cast Irons," has been compiled primarily for design engineers and presents the many valuable characteristics of modern alloyed cast irons. It contains many photos of typical applications and useful tables of properties. Send your request to THE INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York 5, N. Y.

Inform-A-Gram No. C15.

FEDERAL Quality Tested PRESSES
27 YEARS OF QUALITY CONSTRUCTION
BALANCED POWER
Built of finest materials, all working parts of Federal Presses are carefully machined, fitted and aligned to provide balanced power throughout their operating range. Choose Federals for your press room. Six to 80 tons. Also dial feeds. Write for catalog.
THE FEDERAL PRESS CO.
807 Division St., Elkhart, Ind.

Presses: Punch

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Quality Control, from page 124

springs will be described.

For main seat springs 9½ gauge wire corrugated strips are used. From the corrugator the flat strips first have their cut-off ends straightened so that they can be properly attached to the frames. Improperly straightened ends will cause imperfections in the counter and shape of the finished seat and to eliminate this possibility a press operation of straightening ends is checked according to the same principles described earlier. The method of gauging the straightened ends is shown in Figure 14.

The procedure is for the inspector to gauge twenty springs taken by random sampling every half hour. The results of this gauging are recorded on the "np" chart shown. The control limit on this chart is zero, that is, after one bad end is found, the springs that have been made since the last previous inspection are sorted out for bad ends and corrective action taken. On the average only 1.5% or less of these springs will be out of gauge limits.

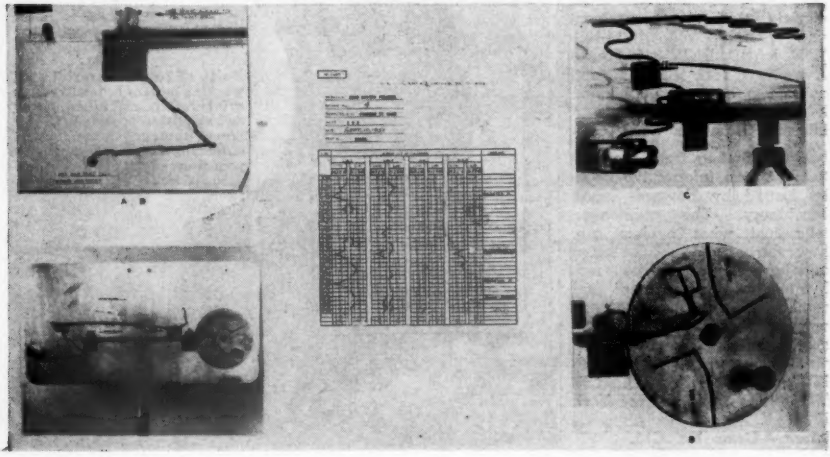
This control point has resulted in a definite reduction in the number of seat springs rejected. It will be noted on the "np" chart, Figure 14, that there is a comment column. In this column are notes as to why unusual deviation from normal occurred. This system of commenting on deviations is used on all charts and contributes considerably to making necessary corrections or adjustments so that normal production flows with a minimum of deviation.

After the end straightening operation the main seat spring strips are placed in feed magazines on the automatic seat folding machines, Figure 15. The folding operation is again a critical operation in the correct formation of seat springs and quality control is emphasized at this point in the process. The same system applies and periodic samples of five springs are taken and gauged, Figure 16. The results are recorded on an "np" chart similar to the ones used at the back spring folders. Again, if more than two out of the five consecutive pieces are beyond the tolerance limits a machine adjustment is made.

The gauges are constructed so that

(Continued on page 136)

Fig. 16. These gauges are so constructed that each individual bend or formation is measured separately. This means when corrections are necessary, the exact adjustment to be made on the folding machine has been predetermined. This inspection operation is conducted on a periodic sampling of five springs. If more than two out of five consecutive pieces are beyond the tolerance limits a machine adjustment is made. Any deviations at the gauging points are recorded on the "np" chart.



Send Barth your

"KING SIZE"

DIE & FIXTURE JOBS!

EN YOU NEED LARGE DIES, tools fixtures, remember that "bigness no barrier" at Barths . . . "king size" s are regular routine production n at the Barth plant.

The die and fixture illustrated indi- te the wide scope and range of Barth cilities, equipment and engineering ow-how for producing dies, tools and tures regardless of size from those "king size" jobs to the smallest gmy size" jobs . . . and all are built h characteristic Barth precision and l for accuracy and long life . . . for imum quality plus quantity produc- n. Write for the Barth catalogue.

King Size . . . Barth Built
BLANKING DIE
for
TRUCK RUNNING BOARDS

King Size . . . Barth Built
ASSEMBLING FIXTURE
for
ASSEMBLING CIRCULAR TRACKS

Contract Services

BARTH

STAMPING & MACHINE WORKS, Inc.

12650 Brookpark Road, Cleveland 29, Ohio

DESIGNERS AND BUILDERS OF DIES, TOOLS AND SPECIAL MACHINERY

. . . Small Lots, from page 122

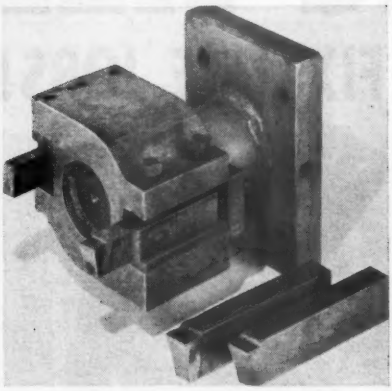


Fig. 6. The holder and cutters used on a turret lathe for trepanning chuck bodies. The cutters are of steel shank, non-standard style and a different pair is required for each size chuck manufactured. In trepanning chuck bodies a cut of approximately 1½" deep is taken with a double cutter as shown above. Although the job is running as planned, no comparison has been made as to the savings.

on savings for this is an example of co-operation between Tool Design and the Carbide Department and it is running as originally planned.

Ordinarily we do not attempt to use expensive form tools because of our small lot production, but as an example of what can be done for one aircraft part for which we used a high speed cutter that cost approximately $100, we were able to substitute a carbide cutter of our own design that cost only $10. Production increased on the job by more than 300% and expensive polishing operations were eliminated.

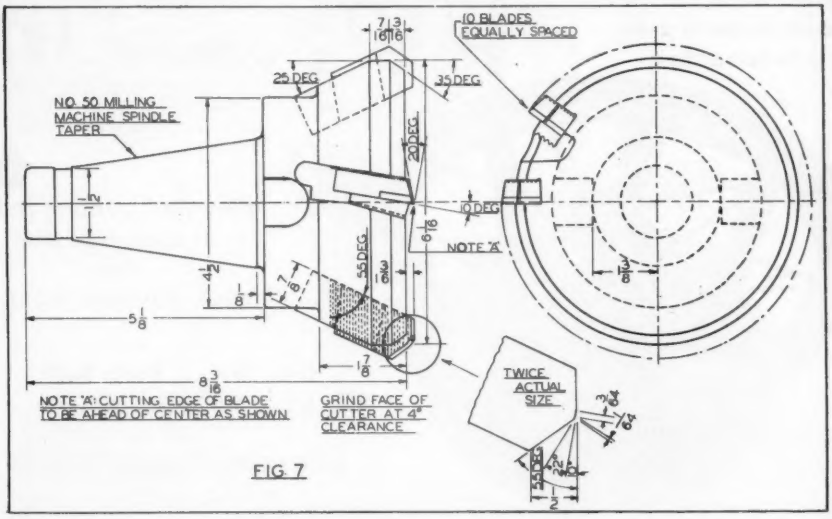
There has been a recent increase in the demand in our shop for more and more carbide milling cutters to be used in steel of various types. In this connection we have worked out a steel roughing cutter that has been very satisfactory for general purpose work (see Figure 7).

Summary of What We Have Done and Would Recommend

All that has been accomplished and all

(Continued on page 149)

Fig. 7. Due to a recent increase in demand in the company shop for more and more carbide milling cutters to be used in steel of various types, the steel roughing cutter shown has been developed. The milling cutter shown is Right Hand only and a similar one is available for Left Hand cutting. The holder is of AISI 4150 steel and the carbide tips are general purpose grade.



CLAUSING

12" LATHE

6300 SERIES

1" Collet Capacity, 1⅜" Bore
A.S.A. L-00 Tapered Key Drive Spindle

HEAVY DUTY PRECISION V-BED

No. 6307 Lathe
No. 7515 Taper Attachment

EVERY feature that makes a precision lathe is incorporated in the Clausing 6300 series. Steel spindle is forged, precision-ground-nose is hardened, ground — turns on selected Timken tapered roller bearings. Headstock gears are steel, run in oil. Dual V-belt drive. Heavy bed combines 2 precision-ground Vee-ways and 2 precision-ground flat ways. Apron is *heavy, double-walled, automatic* — with splash lubrication, positive clutch, steel and cast-iron gears. 8 speeds — 50 to 1300 RPM. Variable drive (optional) provides infinite range of speeds between 30 and 1400 RPM. Quick change ½" steel gears run in oil — instant selection of 48 threads or feeds, from 4 to 224. ⅜" Acme thread lead screw — supported in gear box by two Timken tapered roller bearings. 12¾" swing over bed. 7½" over saddle. 24" – 36" – 48" between centers.

An outstanding lathe, an outstanding value. Catalog sent on request.

Atlas CLAUSING PRECISION MACHINE TOOLS ATLAS PRESS COMPANY

ATLAS PRESS COMPANY
CLAUSING DIVISION
284 No. Pitcher Street
Kalamazoo, Michigan

Lathe Production

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Quality Control, from page 132

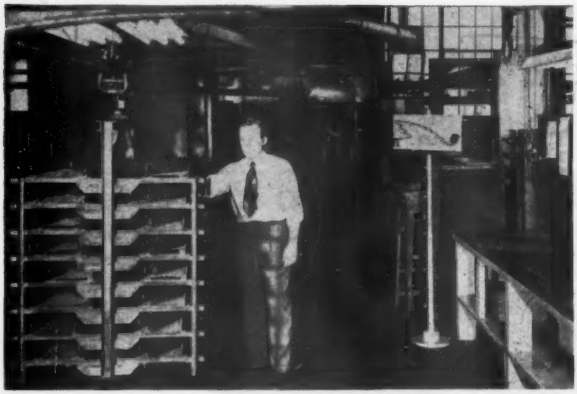
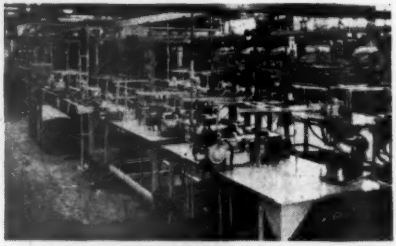


Fig. 17. (left) From the folding machines the springs are heat treated after which the racks of springs are placed under fluorescent lights and are examined visually for uniformity of distortion. A final checking fixture is shown on the pedestal in background.

Fig. 18. (below) Border wires for both back spring and seat spring assemblies are formed in this department. The wire for border wires is graded before distribution to the operators.



each individual bend or formation is measured separately so that when corrections are necessary, the exact adjustment to be made on the machine has been predetermined. At the lower left-hand corner of Figure 16 is shown the entire gauging fixture. The upper left-hand corner shows a spring in position to determine the form of the front end of the spring. If the #1 bar is within the target on the fixture the front formation of the spring is within tolerance. However, this does not entirely reflect the accuracy of the fold on the #1 loop of the spring and in the picture in the upper right hand corner is seen the spring on the gauge which determines the accuracy of this individual fold at the #1 loop.

The picture in the lower right hand corner shows the spring in gauging position for determining whether or not the four folded angles in the rear end of the spring are correct. On the "np" chart

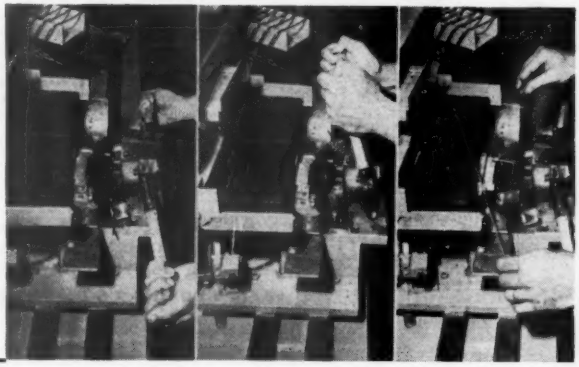
(Continued on page 140)

Fig. 19. Most of the various border wire formations are made on air- and hand-operated forming tools. A typical operation is shown in these three views.

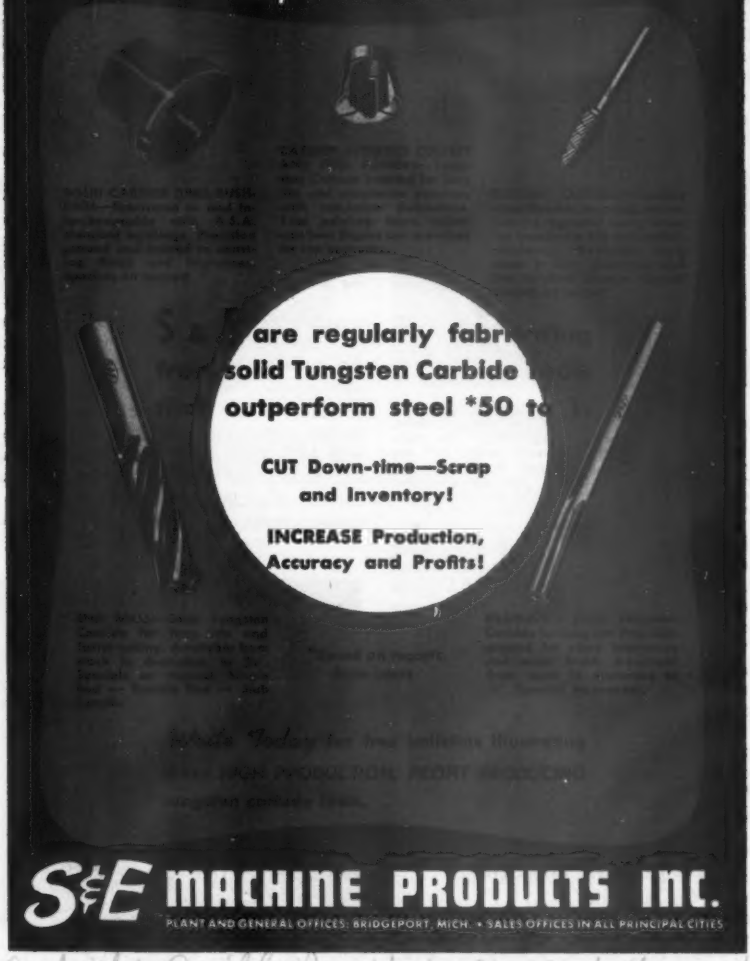
(Left) A wire in position, air locked and partly formed.

(Center) Additional forming by hand.

(Right) Removal of a finished piece and the positioning of a new wire.



TUNGSTEN CARBIDE
Specialists



S&E MACHINE PRODUCTS INC.

PLANT AND GENERAL OFFICES: BRIDGEPORT, MICH. • SALES OFFICES IN ALL PRINCIPAL CITIES

Carbide Drill Bushings — Carbide end mills
Carbide Inserted Collets — Carbide Reamers
Carbide Rotary Files

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Armor Steel, from page 98

rake. It was found that carbide single point turning and boring operations were most successful when run dry.

After the locating ring is machined, the hinge lugs are straddle milled on a 36/72 duplicator type horizontal mill, Figure 8. To obtain the necessary arbor rigidity, an arbor support was built and mounted on the machine as shown in Figure 9. The hydraulic control for the vertical head travel was blocked out and the head locked in position. The hinge lugs are used for all subsequent radial location. The hinge holes are line reamed in a 6'17" radial.

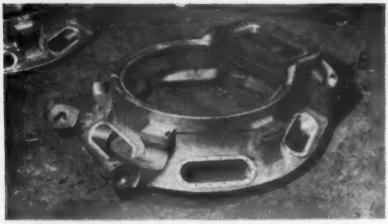


Fig. 10. This view of the cupola casting shows two of the four pads, "A", and the skate surface, "B", which is opposite the hinge lugs. The pads and skate surface are of equal radii but on different center lines. The job is run on an Ingersoll with rotary table. An air cylinder shifts the fixture from one center location to the other.

There are four pads, and a skate surface which is directly opposite the hinge lugs. Figure 10 shows the pads "A" and skate surface "B". These machine gun pads are milled flat but are located on a radius. The radii of the pads and the skate are the same, but the center lines are different. A vertical miller with rotary table is used for this operation. The fixture was built with an integral air cylinder which relocates it longitudinally in conformance to the two centers.

The periscope opening and periscope bezel face are then machined. This operation is performed on an adjacent vertical mill equipped with a follower device which controls the longitudinal and cross travel of the machine.

As can be seen in Figure 11, the entire fixture is skewed in relation to the machine travel. This was done to keep both of the hydraulic cylinders working.

It should also be noted that only one

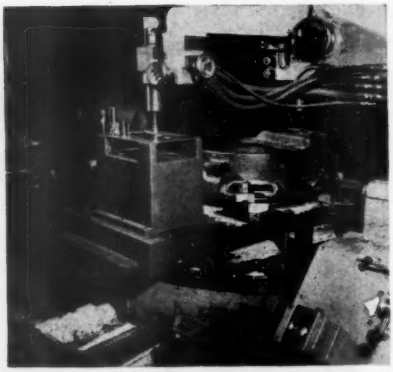


Fig. 11. The standard vertical mill and tracer follower setup for machining the periscope opening and periscope bezel face. On this particular operation, duplicator control effected a 50% saving in time.

template is used for two cutters. The size is controlled by the diameter of the stylus. As in most operations, the coolant is a soluble oil.

Previous to the installation of the tracer equipment, the periscope opening was milled in the conventional manner, i.e., using the regular table feeds and cutters of a diameter corresponding to the corner radii. After installation of the

(Continued on page 142)

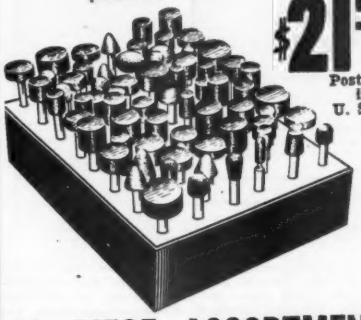
Fig. 12. Milling the straight portion of the "D" shaped opening. The straight cut and two small radii at the ends of the straight cuts are tracer controlled. The rotary table feed is employed to finish the circular portion of the "D".

72 ABRASIVE WHEELS & POINTS

BRAND NEW PERFECT FIRST QUALITY MOUNTED ON 1/4" STEEL MANDRELS

SAVE UP TO $25.00

ONLY $21.50 Postpaid in U. S. A.



72 PIECE ASSORTMENT

ON 1/4" MANDREL

12 POPULAR SIZES & SHAPES—6 EACH On 1/4" Mandrel

		Dia.		Depth
1.		1 1/16"	x	1/8"
2.		5/8"	x	1/4"
3.		3/4"	x	1/8"
4.		3/4"	x	3/8"
5.		3/4"	x	3/4"
6.		1"	x	1/2"
7.		3/4"	x	1/4"
8.	A-61	3/4"	x	1/2"
9.	A-90	1/2"	x	1/2"
10.	A-41	5/8"	x	5/8"
11.	A-111	1"	x	1"
12.	A-24	1/4"	x	3/4"

Make no mistake. Do not let the unheard of low price mislead you. This is NOT "surplus" goods, inferior merchandise or seconds. Every one of the Wheels and Points is brand new, first quality and perfect. The type of mounting, quality of steel mandrels, grade of abrasive materials are identical to the finest on the market. Only because of our buying power, low overhead and small margin is such a sensational bargain possible.

IDEAL FOR ALL INDUSTRIAL PURPOSES

Plants all over the U. S. have been using Schupack wheels and points for years with excellent results. Our assortment includes the most popular sizes and types. However, we can supply ANY ASSORTMENT you want. List the types and sizes and we will fill your order at no extra cost.

10 DAY FREE INSPECTION OFFER

Drop us a line on your stationery, SEND NO MONEY. We will ship any assortment to any rated concern in America on approval. We invite you to make any comparison you like.

144 ABRASIVE WHEELS & POINTS

BRAND NEW PERFECT FIRST QUALITY MOUNTED ON 1/8" STEEL MANDRELS

SAVE $65.10

ONLY $28.50 Postpaid in U. S. A.

ACTUAL LIST VALUE $93.60

Here's What You Get—List Value $93.60
Our Price $28.50—You Save $65.10

16 MOST USEFUL SIZES—9 OF EACH SIZE

Style	Quantity	List Price	Style	Quantity	List Price
W-204	9 @ 65¢	$5.85	B-41	9 @ 80¢	$7.20
W-182	9 @ 50¢	4.50	B-44	9 @ 70¢	6.30
W-201	9 @ 55¢	4.95	B-70	9 @ 70¢	6.30
W-200	9 @ 55¢	4.95	B-104	9 @ 70¢	6.30
W-185	9 @ 55¢	4.95	B-61	9 @ 75¢	6.75
W-203	9 @ 60¢	5.40	B-135	9 @ 55¢	4.95
W-175	9 @ 55¢	4.95	B-111	9 @ 75¢	6.75
B-121	9 @ 70¢	6.30	B-101	9 @ 80¢	7.20

GUARANTEE

If after 10 days you are not fully convinced that this is the greatest wheel and point value in the Industry, return the set at no cost or obligation on your part.

EACH ASSORTMENT COMPLETE IN HANDY, STURDY CONTAINER AT NO EXTRA COST. SATISFACTION GUARANTEED!

ILLUSTRATED CATALOG SENT FREE ON REQUEST!

SCHUPACK SUPPLY COMPANY • 7331 Cottage Grove Ave., Dept TD-12 Chicago 19, Ill.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Quality Control, from page 136

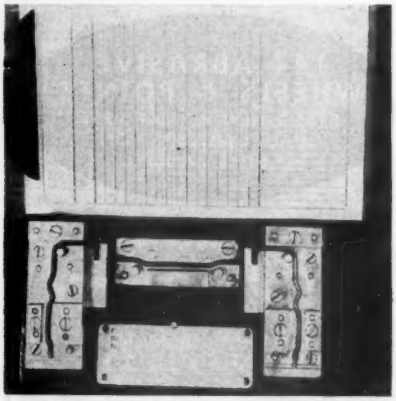


Fig. 20. A typical border wire is checked on the gauge shown above. Recording the results of the inspection permits evaluation of operator skill and detects defects in the forming fixture.

shown in the center are recorded the deviations at the gauge points a, b, c and d. When any one of these four gauge points are beyond limits on three out of five samples, compensating adjustments are made.

From the folding machines the springs are heat treated and after heat treatment the racks of springs are placed under fluorescent lights as shown in Figure 17 and visually examined for uniformity or distortion. Since the heat treatment on seat springs changes contours or dimensions very little these springs are not checked on a gauge after heat treatment. Checking gauges are available at this step in the process if there is any question as to the final shape and contour of the spring. This fixture for final check is shown in the center background of Figure 17, and reflects the correct contour of the spring in an installation position. Following this inspection procedure the springs are dipped in a wax tank as shown before, for rustproofing and then packed in cartons for shipping.

Border wires for both back spring and seat spring assemblies are made in the department shown in Figure 18. The wire for border wires has previously been grad-

(Continued on page 172)

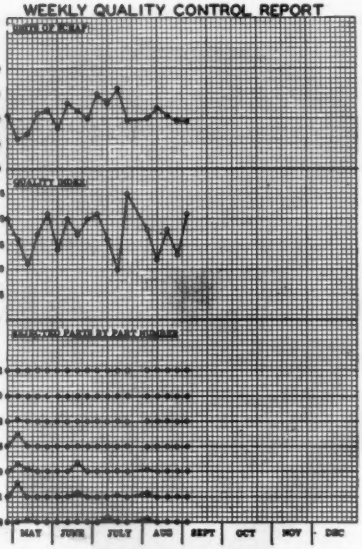
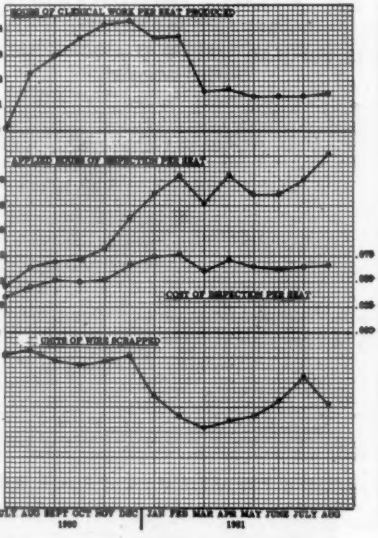
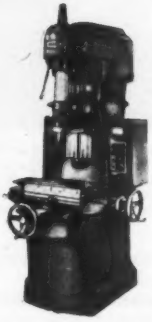


Fig. 21. The weekly graphical resume compiled by the Quality Control Department for Management. Fig. 22. This chart gives a history of the Statistical Quality Control Program through the transition period to complete Quality Control.

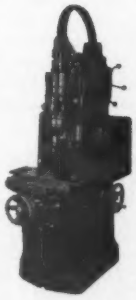


NOW IS THE TIME TO PLAN AHEAD



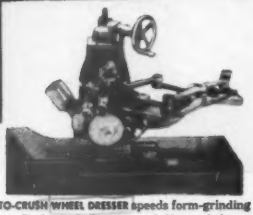
No. 2 MOORE JIG BORER, with its accurate lead screw settings within .0001", offers all the time-proven precision features associated with Moore Jig Borer construction for 15 years, plus numerous labor-saving advantages, including: increased capacity and size; infinitely variable spindle speeds; 3 power feed ratios; centralized controls.

No. 3 MOORE JIG GRINDER. With this new and larger Moore Jig Grinder, *regular and irregular contours* are ground to size and location after hardening. This extends the Jig Grinder's traditional function of relocating straight and tapered holes. Holes from 1/64" to 8" can be relocated and ground within .0001"—by power or hand feed.



Four ways to cut costs and meet competition by mechanizing your toolroom.

No. 1 MOORE JIG BORER remains in the line. For its range—table working surface of 10" by 16" and cuts up to 3½"—this machine is still an ideal buy. There are over 1000 satisfied users. We will continue to offer it for the many situations where a small, accurate jig borer fills the required prescription.



MOORE PANTO-CRUSH WHEEL DRESSER speeds form-grinding and cuts costs. Both crush-forming and diamond-dressing are accomplished with this 2-in-1 unit permanently mounted on the wheel spindle of a surface grinder. You switch from one method to the other without disturbing workpiece setting.

We'll be glad to send you complete descriptive literature on any of these machines.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Ave., Bridgeport 7, Connecticut

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Armor Steel, from page 138

duplicator control, a time saving of 50% was realized.

The milling of the door opening and seal slot is unusual and interesting. A vertical mill with a rotary table equipped with a follower device to control the cross travel of the head was set up for this operation. As can be seen from Figure 7, the opening is "D" shaped. The two small radii at the corner of the straight edge and the straight edge are tracer controlled. The hydraulic system is then shut off, and the rotary table feed turned on to finish the cut. Figure 12 shows the straight cut, under tracer control, near the end of its travel. Here again the coolant is soluble oil and in great quantity.

Fig. 13. A clearly detailed view of the angular position of the indexing fixture which brings successive prism bezel faces under the machine spindle, and the tracer stylus and control template.

The five prism bezel faces are machined on a vertical hydraulic miller with 360° tracer box. An 18" riser was needed under the head for the necessary clearance. Figure 13 shows in clear detail, the angular position of the indexing fixture required to bring one prism bezel face into position under the machine's spindle, together with the tracer stylus and control template.

The holes in the bezel faces, both prism and periscope, and the holes in the hinge lugs are then drilled in a specially-built multiple drill, Figure 14. As can be seen, this machine consists of four heads and

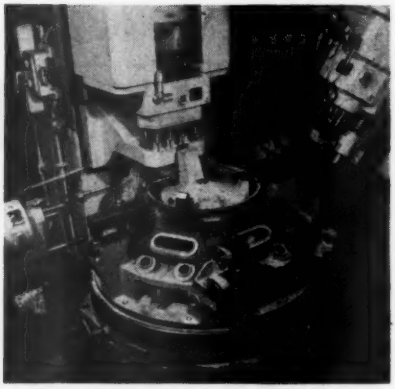


Fig. 14. The holes in the bezel faces (prisms and periscope) and the holes in the hinge lugs are drilled in this special-design drill head machine. The setup consists of four heads and an indexing fixture mounted on easily loaded shuttle table.

an indexing fixture mounted on a shuttle table for easy loading.

The tapping of the holes is done singly, using special friction type tappers and a radial drill. Tap breakage is held to a minimum by the friction type tappers.

The most difficult operation is machining the five prism openings. This was solved by breaking the operation into three phases.

The first phase consists of rough boring

(Continued on page 225)

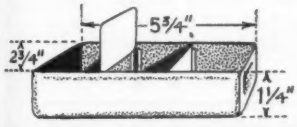
Fig. 15. Two special inserted blades, carbide-tipped cutters in a two-spindle head on a horizontal boring mill rough bore the five prism openings. Converting this operation to carbide rang up a time saving of over 75%.

All Metal JIFFY CABINETS

Now available in 6 Useful sizes!

64 DRAWER	32 DRAWER	24 DRAWER	16 DRAWER	12 DRAWER	8 DRAWER
$24.95	$12.95	$9.95	$7.95	$6.95	$4.95

1001 Time-Saving Uses For Home and Business!



Solid aluminum drawers complete with aluminum dividers and colored index tabs.

SMALL PARTS	BOLTS	CARBIDE TIPS
WASHERS	NUTS	MOUNTED POINTS
NAILS	DRILLS	TOOLS
SCREWS	TAPS	LABELS

and YOU NAME IT!

All metal JIFFY cabinets have a sturdy steel frame with hammered aluminum finish in silver gray color. Drawers are solid aluminum. Individual metal drawer guides keep the drawers in a free sliding position. Full requirements of removable drawer dividers and colored index tabs furnished with each unit.

WE PAY ALL SHIPPING COSTS

CLIP AND MAIL

TO: HANDY PRODUCTS
P. O. BOX 2447, CLEVELAND 12, OHIO

PLEASE SEND IMMEDIATELY THE QUANTITY AND SIZE JIFFY UNIT LISTED BELOW

☐ 64 @ $24.95 ☐ 32 @ $12.95 ☐ 24 @ $9.95 ☐ 16 @ $7.95 ☐ 12 @ $6.95 ☐ 8 @ $4.95

F-52

PLEASE SHIP AS FOLLOWS:

☐ Open Account Purchase Order Enclosed
☐ Check or Money Order Enclosed
☐ C.O.D.

Ohio Customers Add 3% Sales Tax
U. S. A. Only

FIRM _____

ADDRESS _____

CITY _____ STATE _____

ORDERED BY _____ DEPT. _____

Forge Plants Can Be Safe Plants!

In the making of forgings, safety hazards are present from the beginning. From the time the steel arrives in the steel yard by railroad car or truck, until it goes out the back door in the form of finished forgings, safety hazards are present which must be both recognized and respected. I am going to take you through an imaginary forge shop, hazard by hazard, in the production of a forging, discussing some of the safeguards used by that industry in the prevention of accidents. The forge shop we are about to visit is imaginary. The hazards we will see are not in any sense imaginary.

by Charles D. Brainerd
Safety Engineer
Oldsmobile Division, General Motors Corp.
Lansing, Mich.

Several methods are used in unloading steel from railroad cars and trucks the most common being the magnet crane, or wire rope and chain slings. It is most important that competent personnel be selected and trained to operate cranes and handle the general direction and hook-up of chain or cable slings.

It is important that proper specifications be maintained at the steel mill for handling the bundles of steel so that they are bound securely when received at the storage yards. Good, secure tiering of the bundles in the storage yard is of paramount importance. Ample working space must be maintained for the workmen in the yards. Extreme caution must be exercised by men working in railroad cars and on trucks. They must maintain proper clearance in case steel bundles break open during unloading operations. The use of blue flags is a necessary protection for the worker in guarding against unpredicted movement of cars by switch crews, while men are in the cars.

★ ★ ★

Mr. Brainerd's article originated as an address before the National Safety Council's 1951 Congress. We gratefully acknowledge the Society's permission to present it here. Many of the author's recommendations apply to plants other than forge shops. Ed.

★ ★ ★

"LOOK HOW RUDOLPH'S OUTPUT HAS INCREASED SINCE THEY CHANGED TO THE RIGHT CUTTING FLUID!"

IN A TEST on Gleason Revacycles in a large gear department Stuart's SpeedKut "A" increased output from 1200 to 3200 gears per tool grind and reduced stock removal, when regrinding cutters, from .009" to .0035". Let a Stuart Representative help you.

Are you receiving Stuart's SHOP NOTEBOOK regularly? Write, wire or phone.

D.A. Stuart Oil Co.
2729-37 South Troy Street, Chicago 23, Illinois

Employes should be alerted to the danger of walking under loads suspended by the crane. Warning devices should be provided at all doorways leading into the steel yard to prevent employes from walking out into the crane bays while steel is being moved.

Hand hazards are prevalent in the steel yard. Employes must be properly instructed as to the hazards and tools provided, such as hooks and poke poles, to prevent exposing the hands when turning bundles. Due to the weight involved, very serious hand, leg and foot injuries will occur if precautions are not exercised and discipline maintained.

Raw materials in the forge plant consist of bars and billets. The bar stock must be cut into shorter lengths for forging purposes. These short pieces are called billets. The shearing is usually done on a vertical shear. The bushing shear is becoming more prominent in shearing of bar stock in some plants. This method of shearing permits the point of operation to be guarded easily. The operation can be set up in a conventional type power press which gives a much greater range of control selection. Some plants have successfully sheared stock up to three inches in diameter by this method.

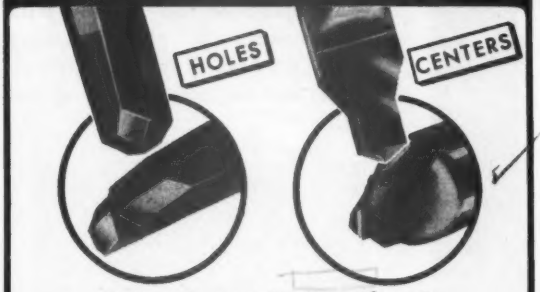
Shearing operations present serious hand hazards which must be discussed in detail with men assigned to the shear operation. It is advisable to guard the feeder rolls, both live and dead, at the shear hold down and feed end of power conveyor. Wrench type tools and hooks should be provided for rolling bar stock onto live feeder rolls at the shears. The tools prevent hands from being exposed between bars of stock and the conveyor bed.

Caution must be exercised in cutting banding wires or banding irons. This work is usually done with a "cold cut" which should be designed so that the wire or banding irons can be cut while standing to one side and away from the front of the bands. This eliminates the possibility of bandings flying out and striking an employe when tension is released.

We should eliminate as much as possible the handling of sheared stock by hand. Automatic loading devices are being used successfully in some forge plants. Belt conveyors are being used on smaller billets to remove sheared stock from the back of the shear. This method reduces fatigue and keeps the shear helper away from the shear blade danger zone.

DRILL HARDENED STEEL

FAST • ACCURATE • NO ANNEALING



Designs Proven In Our Shop On Thousand Of Salvage Jobs

Our experience in the reconditioning of High Speed Steel and Carbide Cutting Tools has resulted in the development of special cutters which have a variety of applications. Two of these tools are shown above.

Write for our catalog.

National TOOL SALVAGE CO.

6511 Epworth Detroit 10, Mich.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Furnaces

After the stock is sheared to the desired length it is ready for heating to forging temperatures. Forging furnaces are divided into two general classifications: the box or slot furnace, and the continuous furnace such as the pusher and rotary type.

Furnaces should be ventilated to the outside atmosphere. Heat radiation from furnaces is a serious problem in forging work. It is most important that every known means be used to confine heat to the furnace heating zone and to exhaust escaped heat from the working area. Much can be done in the design of the furnace to bring about these conditions. Air curtains, water spray, exhaust hoods and insulation are used.

Layout of the furnace operation is very important. The provision of suitable working conditions, cross ventilation and sufficient overhead and floor space are important. Crowded furnace operations have been and still are common reasons for poor working conditions in forge plants. Some plants have piped in a fresh air supply to their furnaces and hammers to relieve heat conditions.

Furnaces should have proper safety controls to shut off the fuel supply in case of electrical, fuel, flame or air supply failure. Furnaces should be inspected often to see that the controls are in good operating condition.

Moving parts such as chains, sprockets, limit switches, pusher stop blocks, exposed door stops and counter-balance weights should be guarded.

Induction heating is becoming increasingly popular in the forging industry as a means of heating steel to forging temperatures. This method has many characteristics which make it popular among forging people. Less floor space is required to set up the equipment and very little heat is radiated from the unit into the work area. This fact reduces greatly the heat fatigue which is experienced at the gas or oil furnaces.

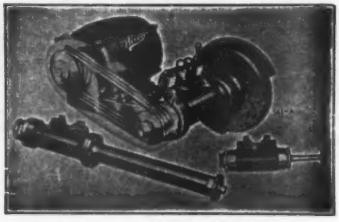
Hammers

After the steel is brought up to the desired temperature, it is forged into shape by one of several methods which include board hammer, steam or air hammer, upsetter, or forging presses.

The hammer is a heavy impact machine which, by the very nature of its construction sets up serious stresses and strains through

THE Hisey WIDE RANGE PRECISION GRINDER *versatile & rugged!*

The indispensable tool for use with lathe, boring mill, planer, milling machine, etc., for all sorts of internal, external and surface grinding operations.



Interchangeable spindle units provide widest application for production and tool room work.

Write for Catalog 71-TM

Hisey THE HISEY-WOLF MACHINE CO.
CINCINNATI 8, OHIO

grinder Tool Post.

all parts of the machine when in operation. It is, therefore, necessary that a preventative maintenance program be carried out on such equipment. Periodic checks should be made of all parts of the hammer. It must be remembered that failure of one of these parts often causes serious accidents in the hammer shop. Preventative maintenance is an important phase in safe and efficient forge operation.

Board hammers should be equipped with suitable board guards to prevent broken boards from dropping down on employes. Some plants use overhead screens to protect operators in case parts of the upper mechanism should break and fall. Hammers that are direct driven with motors mounted on the top of the hammer should have safety cables on the motor to prevent the motor from falling in case the mounting breaks. These hammers should be inspected several times on each shift.

Overhead platforms and ladders provide safe footing for maintenance work such as adjusting rolls, bolts or oiling. The installation of safety cables at the eccentric rod pin, friction rod and releasing arm are important safety features in preventing injuries when these parts fail. The installation of safety cables or chains at the gland bolts, cylinder bolts and cylinder head are important features in preventing injuries at the steam hammers.

Suitable props or safety blocks must be provided for all hammers to provide a safe method for blocking up the ram. Various materials may be used for props. The safe working load of each prop must be calculated and care be taken to see that the proper size prop is used on each hammer. A place should be provided for the props when they are not in use.

Treadle latches or locking devices are often used on treadles. Such devices are effective in preventing accidental operation of the treadle, but sometimes give the operator a false sense of security, inasmuch as they do not prevent the accidental descent of the ram. This is particularly true on steam hammers, for if the shut-off in the steam line is closed, the ram will fall, regardless of the treadle movement.

All steam hammers should be equipped with compression steam cushion safety heads. These heads are used to prevent the piston from hitting the cylinder head and breaking the head, cylinder flange or head bolts. This head should not be struck during ordinary operations as it is in-

(Continued on page 156)

High holding pressures and precision construction of "De-Sta-Co" Toggle Clamps make this assembly fixture efficient. Locating pins welded to clamp bars *locate* channels for welding assemblies of varying lengths. Positive holding pressures, up to 4000 pounds in some models, hold parts in close contact essential for good production welding. *The same principles* apply to your drilling, machining, bonding, gluing or other production processes. Quick toggle action permits fast, safe loading and unloading of fixtures, uniform results, even by untrained workers.

Your nearby "De-Sta-Co" Distributor stocks more than 40 models for your convenience. Write for his name and your copy of new catalog issue.

DE-STA-CO DETROIT STAMPING COMPANY

344 MIDLAND AVE. • DETROIT 3, MICH.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Clamps: Toggle.

Solid Carbide Cutter for Tough Steel Milling Jobs

At the right is shown a new Futurmill face mill made by Detroit Milling Cutter Co. This cutter is unique in that the solid carbide square blades are preground and set into the cutter body with slightly double negative axial and radial rake angles to provide automatic clearance and enable them to be simply indexed rather than be resharpened. After the four cutting edges on one side of the blade have been used, the blade is merely reversed so that an additional four cutting edges are presented. This gives a ratio of 8 to 1 over all conventional face milling cutters which must, of course, be ground each time they become dull.

This principle is proving of great advantage on tough steel milling jobs such as on tank hulls and component parts, stainless applications, etc., where any milling cutter dulls quickly. Being able to quickly index the blades to the eight different positions and to substitute new or reground blades in the cutter body without the costly delay of grinding, enables production to continue uninterrupted without the necessity of a large float of milling cutter head or bodies.

The cutter bodies are made for three primarily sizes of blades, which are all $\frac{3}{8}$" thick. Maximum utility of the carbide insert can be obtained where there are jobs in one plant that can use all three sizes. In this way the blades are reground and handed down from job to job.

Additional information on this new type of solid carbide indexable blade face milling cutter can be had by writing Detroit Milling Cutter Co., 28625 Grand River Ave., Farmington, Mich., or by circling **Inform-A-Gram No. D4.**

MORTON
Fixture Clamps
AND COMPONENTS
Be Sure..
SPECIFY MORTON—Over 30 years experience in fine tool making.
Recognized throughout the industry for the development and manufacture of the most economical and highest quality Fixture Clamps and Standard Details. All precision made of heat treated selected steel, in a wide range of sizes and types to fit the most rigid and exacting requirements. . . . Complete Clamp Assemblies or any of their Component Parts.
WRITE TODAY!
For our 72-page illustrated Catalog showing our complete line and including full size templates for tracing purposes.
MORTON MACHINE WORKS
2423 WOLCOTT • DETROIT 20, MICH.

Visit Booth 1015 At A.S.T.E. Show, Chicago

. . . Small Lots, from page 134

our success have come through a plan laid out when we first started using carbide for general purpose tooling. A carbide installation department was created at the beginning with full responsibility for shop application. This plan is still in use today except that the department has taken on the added responsibility of giving assistance to the Tool Design Department. It is only natural that after we had gained experience in the shop that we would then be able to help Tool Design decide on the feasibility of carbide application for production runs. This has proved most beneficial when new jobs come out of engineering and the tools are in the planning stage. The method is working out very satisfactorily and saves much confusion in the shop.

If you are thinking of a similar program we would like to make the following recommendations based on our experiences.

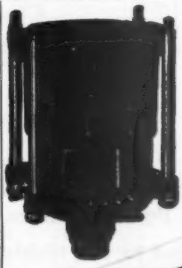
- Study your jobs and take advantage of experience gained by other people. They will be only too glad to help.
- Centralize your control and keep the responsibilities in one place.
- Do your best to instill confidence in your operators and play down the extra care needed to use carbides.

As an example on this last point — about a year ago we installed some turret lathes in our plant at New Philadelphia. Thirty-two new operators were hired and none of them had any experience in the use of carbide tools. We decided to start using carbides right from the beginning.

No chance was given for these operators to develop fear and timidity in its use. After proper indoctrination on speeds and feeds and use of carbides, they were given every assistance while working on the machines. The overcautious feeling does not exist at this plant and we are very gratified with the results.

If these few fundamentals are followed, excellent results can be obtained from carbide tooling in almost any small lot shop.

IF YOU HAVE IDLE METALWORKING EQUIPMENT, you will be welcome in the machine tool industry as a defense subcontractor, especially if this equipment includes planers, millers, cylindrical grinders, radial drills and boring mills. If you send a list of your available shop equipment to the Metalworking Division of the National Production Authority, Washington 25, D. C., it will be passed along to the machine tool builders.



THE VERY BEST

DIE CUSHIONS

290 INSTALLATIONS
(There must be a reason)

For { DEEP DRAWING
PAD CONTROL
KNOCK OUTS

Complete Die Cushion Engineering service at your disposal without obligation on all cushion applications.

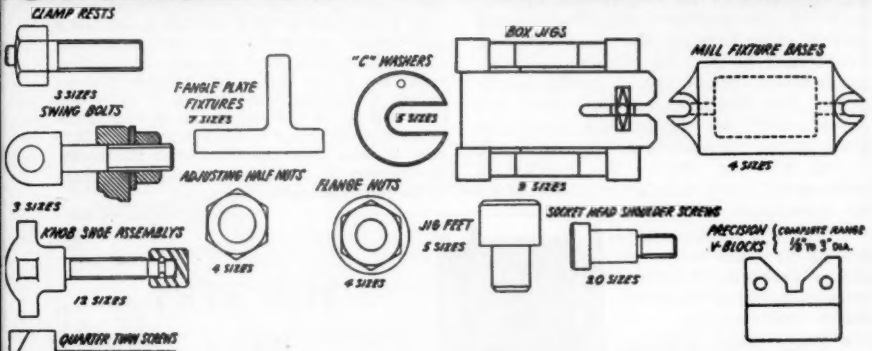
DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7, MINNESOTA

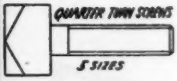
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

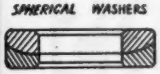
SAVE MAN-HOURS

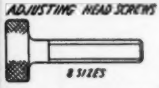
OF YOUR DESIGNERS AND TOOLMAKERS!

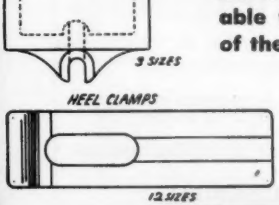
USE NOBLE & STANTON STANDARD JIG AND FIXTURE PARTS











The rush is on . . . manpower shortages are here! Don't waste the valuable time of your designers and toolmakers in custom-building jig and fixture components.

Now is the time to use Noble & Stanton *Standard* Jig and Fixture Parts. Adopt them as standards in your plant. They're the best you can buy—are tough and durable—will never fail on the job—can be used over and over again.

Noble & Stanton Components are precision made from quality steels. NS parts are turned from solid stock—not welded or brazed. They're heat treated and hard chrome plated wherever practicable.

Write today for full information on the Noble & Stanton line of over 300 parts. They cost less than one-third the cost of toolroom manufacture. Tracing sheets are available for every part—saving you design time. Try a few of the items—or stock the whole line!

***WRITE FOR CATALOG.** Send today for this free 52-page book of drawings, specifications and prices.*

Jig & Fixture Parts

NOBLE & STANTON, INC.

1002 BROADWAY • BEDFORD, OHIO

INFORM-A-GRAM CARDS—USE THEM FOR PROMPT PRODUCT INFORMATION SERVICE

INFORM-A-GRAM CARDS—USE THEM FOR PROMPT PRODUCT INFORMATION SERVICE

INFORM-A-GRAM

for ADVERTISEMENT IN FEBRUARY, 1952 Issue ONLY.
PLEASE FILL IN NAME, TITLE, ETC. **COMPLETELY**

Name **Title**

Company **Address**

City **Zone** **State**

1	19	36	53	89	113	139	161	179A	191A	201D	212A	221A	228B	230N
2	20	37	54	90	115	141	162	179B	191B	203A	212B	221B	229A	230P
3	21	38	55	91	116	143	163	179C	191C	203B	212C	222A	229B	230R
5	22	39	56	92	117	144	164	179D	193A	203C	213	222B	229C	230S
6	23	40	57	93	119	145	165	179E	193B	203D	214A	222C	229D	231A
7	24	41	58	95	120	146	166	183A	193C	205A	214B	222D	230A	231B
8	25	42	59	96	121	147	167	183B	193D	205B	214C	224A	230B	232
9	26	43	60	97	123	148	168	184A	195A	205C	215	224B	230C	233
10	27	44	62	99	125	149	169	184B	195B	205D	216A	224C	230D	234
11	28	45	73	101	126	150	171A	185A	196	208A	216B	224D	230E	
12	29	46	75	102	127	155A	171B	185B	197A	208B	217A	224E	230F	
13	30	47	77	103	129	155B	172	187A	197B	208C	217B	225	230G	
14	31	48	79	105	130	156	173	187B	199A	209	217C	227A	230H	
15	32	49	81	107	131	157	175A	189A	199B	210A	218A	227B	230J	
16	33	50	83	109	133	158	175B	189B	201A	210B	218B	227C	230K	
17	34	51	85	111	135	159	176	189C	201B	210C	219A	227D	230L	
18	35	52	87	112	137	160	177	189D	201C	211	219B	228A	230M	

[ ] **Above is new address** [ ] **I would like to receive TOOLING and PRODUCTION regularly.**

INFORM-A-GRAM

for EDITORIAL IN FEBRUARY, 1952 Issue ONLY.
PLEASE FILL IN NAME, TITLE, ETC. **COMPLETELY**

Name **Title**

Company **Address**

City **Zone** **State**

A1	A16	B4	B19	B34	B49	B64	B79	B94	C3	D3	E8	E23
A2	A17	B5	B20	B35	B50	B65	B80	B95	C4	D4	E9	E24
A3	A18	B6	B21	B36	B51	B66	B81	B96	C5	D5	E10	
A4	A19	B7	B22	B37	B52	B67	B82	B97	C6	D6	E11	
A5	A20	B8	B23	B38	B53	B68	B83	B98	C7	D7	E12	
A6	A21	B9	B24	B39	B54	B69	B84	B99	C8	D8	E13	
A7	A22	B10	B25	B40	B55	B70	B85	B100	C9	D9	E14	
A8	A23	B11	B26	B41	B56	B71	B86	B101	C10	D10	E15	
A9	A24	B12	B27	B42	B57	B72	B87	B102	C11	E1	E16	
A10	A25	B13	B28	B43	B58	B73	B88	B103	C12	E2	E17	
A11	A26	B14	B29	B44	B59	B74	B89	B104	C13	E3	E18	
A12	A27	B15	B30	B45	B60	B75	B90	B105	C14	E4	E19	
A13	B1	B16	B31	B46	B61	B76	B91	B106	C15	E5	E20	
A14	B2	B17	B32	B47	B62	B77	B92	C1	D1	E6	E21	
A15	B3	B18	B33	B48	B63	B78	B93	C2	D2	E7	E22	

[ ] **Above is new address** [ ] **I would like to receive TOOLING and PRODUCTION regularly.**

INFORM-A-GRAM

for ADVERTISEMENT IN FEBRUARY, 1952 Issue ONLY.
PLEASE FILL IN NAME, TITLE, ETC. **COMPLETELY**

Name **Title**

Company **Address**

City **Zone** **State**

1	19	36	53	89	113	139	161	179A	191A	201D	212A	221A	228B	230N
2	20	37	54	90	115	141	162	179B	191B	203A	212B	221B	229A	230P
3	21	38	55	91	116	143	163	179C	191C	203B	212C	222A	229B	230R
5	22	39	56	92	117	144	164	179D	193A	203C	213	222B	229C	230S
6	23	40	57	93	119	145	165	179E	193B	203D	214A	222C	229D	231A
7	24	41	58	95	120	146	166	183A	193C	205A	214B	222D	230A	231B
8	25	42	59	96	121	147	167	183B	193D	205B	214C	224A	230B	232
9	26	43	60	97	123	148	168	184A	195A	205C	215	224B	230C	233
10	27	44	62	99	125	149	169	184B	195B	205D	216A	224C	230D	234
11	28	45	73	101	126	150	171A	185A	196	208A	216B	224D	230E	
12	29	46	75	102	127	155A	171B	185B	197A	208B	217A	224E	230F	
13	30	47	77	103	129	155B	172	187A	197B	208C	217B	225	230G	
14	31	48	79	105	130	156	173	187B	199A	209	217C	227A	230H	
15	32	49	81	107	131	157	175A	189A	199B	210A	218A	227B	230J	
16	33	50	83	109	133	158	175B	189B	201A	210B	218B	227C	230K	
17	34	51	85	111	135	159	176	189C	201B	210C	219A	227D	230L	
18	35	52	87	112	137	160	177	189D	201C	211	219B	228A	230M	

[ ] **Above is new address** [ ] **I would like to receive TOOLING and PRODUCTION regularly.**

FIRST CLASS
PERMIT No. 7879
Sec. 34.9 P.L.&R.
CLEVELAND, O.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

POSTAGE WILL BE PAID BY—

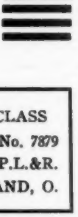
TOOLING AND PRODUCTION
1975 LEE ROAD
CLEVELAND 18, OHIO

FIRST CLASS
PERMIT No. 7879
Sec. 34.9 P.L.&R.
CLEVELAND, O.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

POSTAGE WILL BE PAID BY—

TOOLING AND PRODUCTION
1975 LEE ROAD
CLEVELAND 18, OHIO

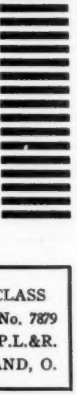


FIRST CLASS
PERMIT No. 7879
Sec. 34.9 P.L.&R.
CLEVELAND, O.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

POSTAGE WILL BE PAID BY—

TOOLING AND PRODUCTION
1975 LEE ROAD
CLEVELAND 18, OHIO



ADVERTISERS INDEX

A-1 Abrasive Laboratories 229C
Abrasive Machine Tool Co. 50
Ace Abrasive Laboratories 112
Ace Drill Bushing Company, Div. West Coast Aero Tool Co. 243B
Acme Industrial Company 196
Aget-Detroit Company 197A
Alina Corporation 221A
Allegheny Ludlum Steel Corp. 2
Allen Company, The A. K. 187A
Allen Mfg. Co. 17
American Measuring Instruments Corp ..... 193B & 230D
American Wheelabrator & Equipment Corporation 21
Arisana Tool & Die Company 230A
Armstrong Bros. Tool Co. 166
Atlas Press Company, Clausing Division 135
Atrax Company, The 87

Balas Collet Mfg. Co. 7
Balder Electric Company 219A
Baumbach Mfg. Co., E. A. 85
Barth Sipe, & Machine Works, Inc. 133
Bay State Abrasive Products Co. 107
Bliss Company, E.W. ..... 54 & 217B
Boeckeler Instrument Co. 179B
Bokum Tool Company 168
Boyar-Schultz Corporation 195B
Brinell Company, The 49
Brown & Sharpe Mfg. Co. 165
Buck Tool Company 56
Bullcol Company, The 222A

Carboloy, Dept. of General Electric Co. ..... 120 & 121
Carborundum Company, The ..... 42 & 43
Challenge Machinery Co., The 116
Champion Tool Company 189B
Chase-Royce Tool Co., Inc. 201A
Chicago Mfg. & Dist. Co. 201D
Chicago Screw Co., The 171A
Chicago Wheel & Mfg. Co. 175A
Cincinnati Milling Machine Co., The 73
Cincinnati Shaper Co., The 6
Cleveland Grinding Machine Co., The 177
Cleveland Universal Jig Co. 230H
Colonial Bushings Inc. 205B
Columbia Tool Steel Co. 210A
Commander Mfg. Co. 183A
Cone Automatic Machine Co., Inc. 47
Conrad and Moser 230E

Danforth Company, C.W. 224C
Danly Machine Specialties, Inc. 57
Davis Tool & Engrg. Co. 230C
Dayton Rogers Mfg. Co. 149
Denning Mfg. Co., The 230J
Detroit Die Set Corp. 29
Detroit Milling Cutter Co. 95
Detroit Power Screwdriver Co. 32
Detroit Stamping Company 147
DeVlieg Microbore Company 31
Dickerman Mfg. Co., H. E. 13
Die Supply Company, The 30
DI Machine Corporation 123
Dreis & Krump Mfg. Co. 212A
Dremel Mfg. Co. 126
Drexel-Beiz Company 230B
Dumore Company, The 233
Durant Tool Supply Co. 205C
Dykem Company, The 216A

Eclipse Counterbore Company 129
Eisler Engrg. Co., Inc. 210B
Electro-Mechano Company 224E
Elgin National Watch Co. 117
Elsitrom Standards Division, Dearborn Gage Company 45
Elox Corp. of Michigan 173
Enco Mfg. Company 231B
Erb & Gray 171B
Erickson Tools, Div. of The Erickson Steel Co. 39
Eutectic Welding Alloys Corp. 218A
EveredE Tool Company 217C
Ex-Cell-O Corporation 5

Famco Machine Company 163
Federal Press Company, The 131
Federal Tool Corporation 175B
Foredom Electric Co. 221B
Fryer Tools & Instruments 224B

Gage Company 233C
Gear Specialties, Inc. ..... 18 & 19
General Die and Stpg. Co. 199B
General Die & Tool Co. 230K
George Gorton Machine Co. 61
Graymills Corporation 186C
Green Instrument Company 58
Grobet File Co. of America, Inc. 181B

H & P Die Stamping Co. 230L
Hager and Son, E. F. 224D
Hamilton Tool Co., The ..... 40 & 119
Handy Products 143
Hardinge Brothers, Inc. 48
Haskins Company, R. G. 227B
Heimann Mfg. Co. 205A
Heuser Mfg. Company 184B
Hisey-Wolf Machine Co., The 146
Holliday & Company, W. J. 83
Hovis Screwlock Company 26
Huot Mfg. Company 157
Hutchinson Company, Wm. T. 193D

Ideal Industries, Inc. 127
Index Machine Company 10
Ingersoll Milling Machine Co., The 33
Inter-Continental Trading Corp. 222B

Jefferson Machine Tool Co. 208B
Jergens Tool Specialty Co. ..... 92 & 93
Johnson Mfg. Corp. 20
Jones & Lamson Machine Co. 91

Kempsmith Machine Company 27
Kennametal, Inc. 111
Kiffer Tool & Die Co. 224M

L & J Press Corporation 215
Lamina Dies and Tools, Inc. 234
Lassy Tool Company 193C
Latrobe Electric Steel Co. 9
Lee Company, K. O. 165
Leslie Welding Company 191B
Levin & Son, Inc., Louis 3
Lincoln Park Industries, Inc. 55
Lucas Machine Division, The New Britain Machine Co. 38
Lucas & Son, Inc., J. L. 229B
Lufkin Rule Company, The 195A

Madison-Kipp Corporation 155A
Master Appliance Mfg. Co. 222D
Manufacturers Engrg. Service, Inc. 241A
Marshall Steel Company 191C
Mead Specialties Company ..... 197B & 201D
Meyers Co., Inc., W. F. 163
Michigan Chrome & Chemical Co. 179D
Micromatic Hone Corporation 113
Milne & Company, A. 15
Minnesota Mining & Mfg. Co. 12
Moore Special Tool Co., Inc. 141
Morey Machinery Co., Inc. 101
Motch & Merryweather Co., The 169
Morton Machine Works 148

National Machine Tool Co. 208C
National Tool Company 99
National Tool Salvage Co. 145
Neise, Karl A. ..... 191A & 203C
New-Field Machined Parts Co. 213
Nichols-Morris Corporation 44
Noble & Stanton, Inc. ..... 150 & 230P
Northwestern 214C
Nu-Matic Grinders, Inc. 167

Ohio Nut & Bolt Co., The 158
Oliver Instrument Company 211
O'Neil-Irwin Mfg. Co. 75

Pailey Supply Company 156
Palmer-Shile Company 77
Parker-Kalon Corporation 52
Parker Stamp Works, Inc., The 155B
Petch Manufacturing Co. 159
Peterson Steels, Inc. 59
Pipe Machinery Company, The 230F
Phoenix Machine Co., The 230R
Podlin Tool Company 208B

Porter Precision Products 8
Pratt & Whitney, Div. Niles-Bemat-Pond Company 25
Precise Products Company 161
Preis Engraving Machine Co., H. P. 217A
Producto Machine Co., The 25
Prosser & Son, Thomas 185A
Putnam Tool Company 1

Raymac Manufacturing Co., Inc. 216B
Reid Tool Supply Co. 193A
Reltcol Corporation 209
Rice Pump & Machine Co. 205D
Richards Company, J. A. 185B
Rivett Lathe & Grinder, Inc. 41
Roll-Feeds Corporation 201B
Royal Oak Tool & Machine Co., D-S Grinder Division 46

S & E Machine Co. 137
Sal Metal Products Co. 179C
Sales Service Machine Tool Co. 39
Scherr Co., Inc., George ..... 214B & 219D
Schraner & Co., A. F. 229G
Schupack Supply Company 139
Scully-Jones and Co. 51
Service Machines Company 189D
Severance Tool Industries, Inc. 34
Shore Instrument & Mfg. Co., Inc., The 230A
Slewok Tool Company 115
Simonds Abrasive Company 97
Sintered Carbide Corp. ..... 227A & 227D
Skyline Tool & Gage Co., 184A & 230T
Smit & Sons., J. K. 227C
South Bend Lathe 28
Standard Electrical Tool Co., The 232
Standard Gage Co. 24
Standard Pressed Steel Co. 90
Steel Products Engrg. Co., ... 96
Strand Co., Edward D. 212B
Strand Mfg. Company 208A
Stuart Oil Co., D. A. 144
Superior Steel Products Corp. 203
Spiral Step Tool Co. 228A
Swartz Tool Products Co., Inc. 187D
Swedish Gage Co. of America, C. E. Johansson Gage Co., A Division 224A

Tamms Industries, Inc. 214A
Tannewitz Works, Inc. 169
Tietzmann Tool Corp. 210C
Timken Roller Bearing Co., The Steel and Tube Division 22
Tiny Tool Company 230G
Tomco Products Co. 201C
Tomkins-Johnson Co., The 60
Tubular Micrometer Co. 102
Turchan Follower Machine Co. 53
Twentieth Century Mfg. Co. ..... 189A & 212C

U. S. Tool Company, Inc. 11
Universal Engineering Co. 199A
Universal Gear Works, Inc. 179A

Valvair Corporation 130
Victor Machinery Exchange, Inc. 109

Wales-Strippit Corporation 16
Walls Sales Corporation 179E
Warner Division of Clinton Machine Co. 125
Watts Brothers Tool Works 229A
Weldon Tool Co., The 164
Wells Mfg. Corp. 176
Wesson Company, Affiliated with Wesson Metal Corporation ..... 62 & 79
West Point Mfg. Co. 22
Wheel Trueing Tool Co. ..... 36 & 37
Whistler & Sons, Inc. S. B. 14
Whitney Metal Tool Co. 225
Willey's Carbide Tool Co. 229D

Yost Mfg. Company 218B

Zagar Tool, Inc. 172

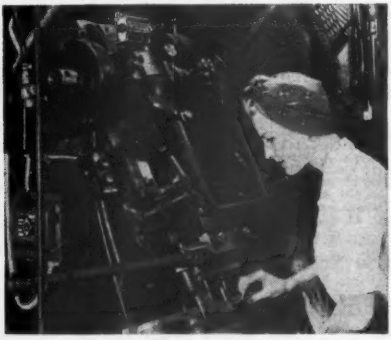
INFORM-A-GRAM KEY NUMBERS

. . . Work Handling, from page 86
especially advantageous, particularly in the case of short runs of rush work. They can be mounted on the die set or bolster plate of the press in any position, for any style die. Thus, it is possible to feed a die from left to right, right to left, front to back, back to front, or at any desired angle.

There are cases in which two or more die feeds are employed on the same die. Therefore, separate ribbons or strips of stock may be fed into a die from different directions, processed in different ways, and finally assembled. Obviously, the versatility of presses is often greatly heightened through use of such feeds. Actuation of this type of die feed is accomplished through a cam and a cam roller. On the down stroke of the press, an obliquely-faced cam engages the roller, and actuates a slide horizontally.

Cylinders Incorporate Over-Riding Clutch Principle

The slide carries a pair of gripping cylinders, which operate on the principle of an over-riding clutch. That is, these cylinders roll freely on the stock in one direction, but instantly lock against rotation in the opposite direction. Thus, in one direction they roll freely on the stock, but in the reverse direction, move the material forward with them. There is a special feed-length adjustment incorporated, by means of which the precise amount of stock carried forward at each cycle may be governed. This particular unit is often referred to as a hitch feed.



This counter, with large scale figures, can be easily read from its elevated position. Such counters are readily reset to zero starts for controlling press run; for instance, to facilitate packaging every two hundred pieces.

Some roll feeds have a completely self-contained drive, independent of the press. One of these is controlled electro-pneumatically. One layout of this type advances stock along a guide. At the end of the guide-way, a limit switch is positioned. When advancing material contacts this limit switch, a clutch-brake mechanism in the roll feed is caused to operate, stopping the feed rolls. In this case, material is cut off and removed from the press by a mechanical-type ejector. As soon as the piece is ejected, the rolls again feed the stock forward, and the cycle is repeated.

A new system of stamping from wide sheet stock in coils is coming into quite general use. In the past, nearly all large blanks have been cut from sheets which were first cut to length. Through using coiled stock on blanks of designs that may be nested, much waste is avoided, and a tremendous saving is realized in the cost of blanks. In connection with this process, a new hydraulic feeding and straightening machine is employed, in connection with a heavy duty coil cradle. This combined equipment feeds the material to the blanking press. A change of feed length can be quickly made when desired.

Machines Are Portable

Such hydraulic feed and straightening units are self-contained and portable. Consequently, they may be moved to any press. Usually, material is fed through the righthand uprights of the press, provided the press has sufficient width of opening between those uprights. Feeding length is controlled by means of an automatic measuring device. This device can be adjusted to feed any length desired from 25″ to 125″, on the standard layout. It may be specially made, however, to provide maximum feeding lengths as great as 200″. Adjustment of the feeding length is made on the measuring device by means of a graduated hand provided for the purpose.

Since coiled strip can now be obtained as wide as 80 inches, and in coils weighing as much as 20,000 pounds, it may readily be appreciated that where parts being stamped can be closely nested, a large

(Continued on page 170)

Use KIPP AIR GRINDERS

if you want to GRIND —not just rub!

MODEL JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind—not just rub. Every mechanic knows this, but inexperienced buyer may order tools that maintain proper grinding speeds only when running idle. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

MADISON-KIPP CORP.
212 Waubesa St., Madison, Wis., U.S.A.

- Skilled in DIE CASTING Mechanics
- Experienced in LUBRICATION Engineering
- Originators of Really High Speed AIR TOOLS

3 SIMPLE STEPS... TO SOLVE ALL YOUR HEAT TREATING PROBLEMS!

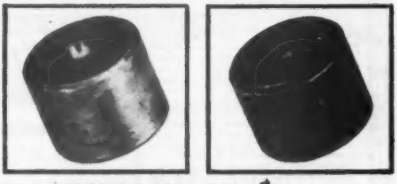
Coat piece with Phoenix Brand NON-SCALING COMPOUND, a dry, easy-to-handle powder.

Harden or anneal piece as normally required—powder forms protective coating completely sealing piece from air.

If necessary, boil in plain water to remove protective coating. Coating comes off quickly, easily . . .

giving you a bright scale-free, pit-free surface like

THIS... not THIS—



EVERY TIME!

Save TIME! Save MONEY!
Send for a trial order TODAY!
—Satisfaction guaranteed—

2 lb. can — $ 6.00
5 lb. can — $15.00
15 lb. can — $41.25
25 lbs. or more
$2.50 per lb.

ORDER TODAY FROM YOU LOCAL DISTRIBUTOR OR WRITE

THE PARKER STAMP WORKS, Inc.
Established 1871
HARTFORD, CONNECTICUT

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Grinders, Portable air

Hardening Compounds

. . . **Forging Plants, from page 147**

tended only as an emergency device. Hammers should not be operated if the steam supply to the cushion head is broken as the cushion has no value without steam pressure.

There are certain precautions that must be taken before any repair work is carried out on a hammer. Steam, air or electric power must be shut off and locked out with safety locks. If work is done on dies, the ram must be properly propped and the treadle blocked up. When shimming dowels to move the die, it is necessary that a suitable prop be under the ram or die. A sledge is not considered safe equipment to use as a prop when doing this type of work. Suitable chains, cables, hoists, chain falls and other necessary rigging should be provided and properly maintained for repair work and die changing.

Suitable driving blocks should be provided for removing broken piston rods from rams. A pin or bar of steel should never be set up on end on the bottom die or sow block to drive out a broken rod from the ram without a proper recessed driving block to prevent the pin from flying out of the hammer.

Ample lighting and clear work area are important factors in repairing or changing dies. Tools and equipment must be kept picked up and in proper storage.

One of the most hazardous operations in the hammer shop is the driving of die and sow block keys. Little progress has been made in providing a better method of doing this work. Most shops still resort to the old battering ram or hand sledge. This method has contributed to many serious injuries.

A few shops are now using an automatic air-operated key driver that has greatly reduced the hazard of driving keys. It has also improved the efficiency and greatly reduced the necessity of lancing keys.

When using the battering ram method for driving keys, there should be four men to guide the ram. The floor area should be kept clear of all obstacles and should not be slippery. Side clearance must be maintained so that should the ram "whip" the men will not be caught between the battering ram and some fixed object.

The ram must be checked often to see that cables and chains are in good condition. It should also be checked for fractures and mushrooming of the driving face. When ends become mushroomed, the ram should be turned down in a

SAVE UP TO 85% ON TOOLS-MACHINERY AND PARTS!!
1952-230 PG. CATALOG
Our latest & biggest CATALOG of NEW and SURPLUS BARGAINS. Thousands of items at UNHEARD OF LOW PRICES! SAVINGS UP TO 85% in Hand & Power Tools, Electrical Supplies, Industrial Machinery, Gas & Electric Motors, Winches, Hoists, Machine Tools, Gauges, Welding Equipment, Pneumatic & Air Tools, Raw Stocks, Aluminum, Brass, Copper & Steel in Sheets, Bars, Rods, Tube & Extrusions, Nuts, Bolts, Rivets, Screws, Wire, Cable & a Huge Stock of HYDRAULIC SUPPLIES including Cylinders, Valves, Pumps, Motors, Fittings, Tubing, etc. While these items last we will continue to sell them at typical low Palley Prices. WRITE TODAY FOR YOUR COPY!
WAR SURPLUS SAVINGS
Stationary or Portable ARC WELDER
Delivers 300 Amps., continuous — or 350 to 400 Amps., intermittent
Designed to weld continuously for hours . . . This unit is built around a rugged, heavy duty, aircraft type generator and comes complete with pulley reactor, output controls, switches and & rheostat mounted on sturdy steel frame. Operates on 15 H.P. for maximum output. Gas or electric motor. For light or heavy industrial work.
97.50
HYDRAULIC PUMP & CYLINDER SPECIALS
Hyd. Variable Displacement PUMP
Will deliver maximum volume at any pressure setting between 600 and 900 P.S.I. Pump housing serves as reservoir for system. Has built-in compressed air super-charger which makes system independent of outside atmospheric pressure. Rotation is left hand only. Maximum speed for continuous duty is 3750 R.P.M. Displacement is .484 cu. in. per revolution, or approximately 4 G.P.M. at 1750 R.P.M. 32.22
Special! HYDRAULIC CYLINDER
Gives 20,000 lb. thrust (push or pull) using 1500 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lbs. thrust with 3000 PSI. Can also be used on low pressure air systems. 4" bore; 18" stroke; 30½" length. Ideal for road-form — shop machinery, etc.
29.75
P-3 STRATO POWER PUMP
With built-in variable flow control valve in head. Positive displacement piston type. Displacement capacity: 2 gal. per min. at 1500 RPM at 1250 PSI. Pressure limit 1250 PSI continuous. 1400 PSI for 15 sec. Operates at 3750 RPM, intermittent max. 4500 RPM. Rotates either direction without adjustment . . 19.50
No. 3 HYDRAULIC CYLINDER
Double action. Bore is 1" — Shaft ½". Has stroke of 2½" to 4". Stroke can be adjusted with internal sleeve stops. Overall length is 8½". Will take 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push up to 1100 lbs.
5.75
P-4 VICKERS ANGLE PUMP
Positive displacement type, angle piston. Displaces .507 cu. in. per revolution. Has capacity of 6 gal. per min. at 3000 RPM at 1500 PSI., continuous, 1875 for 15 sec. Operating speed of 3750 RPM, intermittent maximum, 4500 RPM. Rotates to the right only.
19.19
FOUR WAY VALVE
Poppet type. Pressure balanced. Off at neutral position. Piston type with built-in relief valves for limit of cylinder strokes. 5/8" AN tube size (7/8"-14 thread) inlet & outlet. Ports to cylinder are 1/2" AN tube size 3/4"-16 thread).
9.75
PALLEY SUPPLY CO.
DEPT. TD-2
4321 SAN FERNANDO RD.
GLENDALE 1, CALIF.
Order from this ad. All sales final. All prices F.O.B., Glendale. Pay by M.O. or check. P.O.'s accepted from D.&B. firms. ½ deposit with C.O.D.'s.

lathe to remove the mushroomed surface. An acetylene torch should never be used to dress the driving end of the ram. This practice will set up hard spots at the driving surface which induce fracture areas.

When setting up dies in a hammer, the employes responsible for setting the dies should not allow the key or shim stock to protrude more than three inches beyond the face of the ram, front or back. Protruding keys or shims have caused serious injuries to many hammer operators. Also, the further the key protrudes out of the hammer, the more strain is put on the unsupported end of the key. Keys will break off and have been known to fly under the ram and between the die sections during the forging process, the impact causing the broken end of the key to fly out into the working area.

Good scale shields must be provided to confine the scale at the hammer. Die swabs must be long enough to keep hands and arms from beneath the ram when swabing dies. Tongs of poor design, which fit the forging poorly, have been the cause of many serious accidents in the hammer shop.

You can appreciate from this imaginary trip through a forge shop that good equipment must be combined with good safety practices to control forge plant accidents.

We have merely scratched the surface in this discussion, and have even neglected to mention some of the departments such as the press and upsetter shops and the heat treat, grinding and cleaning departments. All these operations have safety problems which require good, well maintained equipment, and above all, well formulated safe practices.

According to tradition, the forge plant employe more or less shifts for himself. He forms his own tongs; lines up his own work, using what he can find lying around as tools; he sets his own dies; makes his own adjustments on his equipment; and even checks his forgings to see if they are of good quality. This fellow puts a lot of his own thinking in his job. What we must give him as assistance is good direction in the form of high grade supervision. We owe it to him.

We must install guards to protect him wherever possible and in all our contacts with him we must display a sincere concern about his welfare. This concern for his welfare must be displayed consistently.

(Continued on page 177)

Eliminates Rummaging Through Stacks of Drills

No more running out of drills—your entire stock can be seen at a glance. Each size of drill has its own compartment with rounded bottom for easy selection. You can store dozens of small drills and several large ones in their own compartments. Built-in pricing or inventory system eliminates the need for cost sheets, and will keep a record of drills on hand. Stack two or three cabinets to save space. Specifications: 14½" long, 7¼" high, 7¼" deep. Hammerlin baked enamel finish over rugged steel.

Made in three models for fractional, number or letter drills.

WRITE FOR CIRCULAR

By the makers of HUOT DRILL INDEX

HUOT MANUFACTURING CO.

581 No. Wheeler St., St. Paul W4, Minn.

Drill Dispenser

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

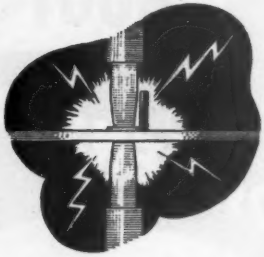
PUBLICATION

Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

Wesson "Multicut," the band type tool holder, is described in Bulletin 511. The carbide insert is held by a strong, tempered steel band and locked or released by a single turn of the set screw on the top of the holder.
Inform-A-Gram No. B1.

Jones & Lamson Die Heads with ground thread tangent chasers are the subject of illustrated literature just out. Chasers are guaranteed to produce threads to Class No. 3 or better. Capacities are from No. 4 to 2".
Inform-A-Gram No. B2.

OHIO WELD SCREWS
For economical Spot Welding



Ohio SS
Spotweld Screws

Thread Sizes,
No. 6-32 to 3/8-24

Materials:-Low Carbon
Steel and Brass

For dependable Projection Welding
Ohio GW and HW weld Screws

Thread Sizes,
No. 6-32 to 1/2-20
Materials:-
Low Carbon Steel
and Brass.

For samples and list of sizes, send to
THE OHIO NUT & BOLT COMPANY
19 First Avenue., Berea, Ohio

Screws! Spot Welding

An Air Hardening Type of Die Steel is now offered by Simonds Saw and Steel Co., according to newly published literature. It is designed to lengthen punch and die life where greater production runs are desired between sharpenings. This 5% chrome type steel will produce up to 50% more pieces per sharpening than the oil hardening type. Sizes, prices, weights and other data are given in the literature. SIMONDS SAW AND STEEL CO., 470 Main St., Fitchburg, Mass.
Inform-A-Gram No. B3.

Kutmore Hollow Mills, available in several different types, are pictured and described in Catalog 20-TD. Standard blades for all mills are available from stock in either HSS or carbide. The exclusive micrometer adjustment of blades eliminates lost time in setup. For a copy of this eight-page catalog, address CARL WIRTH & SON, INC., 1625 Clinton Ave. North, Rochester 21, N. Y.
Inform-A-Gram No. B4.

Hydraulic Duplicator Catalog. Turchan Followers are illustrated and described in an informative new bulletin. Included are illustrations of various applications of the Follower together with a circuit drawing of a single dimension Turchan Follower in a typical application to a vertical mill.
Inform-A-Gram No. B5.

Garberding Stop-Pins and Finger Stops are described in current Twentieth Century literature. The stop-pins are complete self-contained units that hold securely in the stripper plate. The finger stops are made in uniform widths to fit any standard width slots.
Inform-A-Gram No. B6.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

New High-Pressure Springs are available from stock of The Producto Machine Co. They have been designed for all die applications and general machinery use. The drawn, high carbon, oval wire permits a deflection of about 30% where maximum load rate and normal movement are required. A bulletin contains recommendations for use, dimensions and prices. THE PRODUCTO MACHINE CO. 990 Housatonic Ave., Bridgeport, Conn.
Inform-A-Gram No. B7.

Weldon's Tool Catalog 10 contains over 90 pages of information, made more readable by the use of boldface type throughout. It describes many additions to The Weldon Tool Company's line and also features an up-to-date price list. The price list is placed in a pocket on the catalog's inside front cover. No prices appear in the book itself; thus, price revisions will not make the catalog obsolete.
Inform-A-Gram No. B8.

Kuhlmann Small-Size Precision Lathes, distributed in the U. S. by Eric R. Bachmann, are the subject of a 10-page, highly illustrated booklet. Photographs of various models and of lathe components are included, along with typical examples of work. Address ERIC R. BACHMANN, 27-11 41st Ave., Long Island City 1, N. Y.
Inform-A-Gram No. B9.

New Wales Drilling Machines are the subject of Wales-Strippit Catalog DM. They perform precision locating, drilling and reaming of holes in material of practically any length up to 36". Catalog DM is fully-illustrated and functionally-colored.
Inform-A-Gram No. B10.

Six-Spindle Conomatic Bar Machines, made by Cone Automatic Machine Co., Inc., are presented in an extensive booklet. Outstanding design and construction features are pointed out in this 16-page, illustrated booklet.
Inform-A-Gram No. B11.

Carbide Reversible Plug Gages are featured in Size Control's colorful Catalog No. 50. There are 20 pages of photos, data and prices. SIZE CONTROL CO., 2500 W. Washington Blvd., Chicago 12, Ill., will honor all requests.
Inform-A-Gram No. B12.

PEMACO HYDRAULIC AND AIR CYLINDERS
with the NEW
Cartridge Type Packing Gland

Designed to J. I. C. Hydraulic Standards

Pemaco Hydraulic Cylinders are soundly engineered—give long life and top performance. The steel ram is hardened to 50.C Rockwell, ground and lapped. NOW the Pemaco has the first self-contained Cartridge Type Packing Gland.

This new Pemaco "EASY-PAK" Gland is designed to comply with J.I.C. Standards. It combines double bearing surface, low friction ram seal, and a ram wiper into a single compact unit. Easily maintained, the Pemaco "EASY-PAK" Cartridge Type Packing Gland can quickly be replaced in most cases without removing the cylinder from the machine — and by inexperienced help — greatly reducing machine down-time.

Pemaco "EASY-PAK" Cartridge Type Packing Glands are manufactured for both hydraulic and air cylinders.

PETCH MANUFACTURING COMPANY

Write for complete information and engineering data.

36100 HARPER AVE.
MT. CLEMENS, MICH.

Cylinders

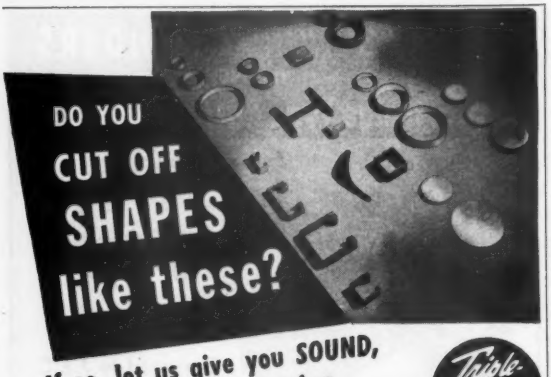
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Technical Information and descriptive literature on Allen Head Screws are offered by Allen Mfg. Co. Many improvements in manufacturing methods and alloys have been made to assure better quality and uniformity of Allen socket screws, dowel pins and pipe plugs.
Inform-A-Gram No. B13.

Carbide Tool Grinder Catalog. Hammond Machinery Builders, Inc., offers its Catalog 225, which fully describes a complete line of carbide tool grinders, chip breaker grinders and diamond finishing grinders.
Inform-A-Gram No. B14.

Flexible Shaft Tools, rotary cutters, circular saws, abrasive wheels and points, and many other products are offered at special low prices in the latest Schupack catalog. Complete illustrations and prices are given in this two-color booklet. Address SCHUPACK SUPPLY CO., Dept. T&P, 7331 Cottage Grove Ave., Chicago 19, Ill.
Inform-A-Gram No. B15.

The Illinois Die Filing Machine is highlighted in an illustrated brochure. This accurate, smoothly-operating machine files, saws and stones the most intricate die shapes.
Inform-A-Gram No. B16.



If so, let us give you SOUND, SOLID REASONS for using the MOTCH & MERRYWEATHER Triple-Chip Saw Blade

"Hi-Lo" principle of grinding teeth produces more work for less money than any comparable method. Low operating cost; faster cutting, clean and burrless; longer tool life. Investigate M. & M. Triple-Chip solid cut-off saw blades now.

Ask for Bulletin No. 201-T.

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING • CLEVELAND 13, OHIO
COMMAND OUR UNPARALLELED EXPERIENCE IN CIRCULAR SAWING

Saw Blades' Slitting

"Dust and Fume Control" is a new, 36-page catalog, published by American Wheelabrator & Equipment Corp., which describes the various sizes and models of Dustube Collectors (cloth-tube type) and the advantages to be gained from cloth filtration. The description of each type of collector is accompanied by complete specifications, construction drawings, cut-away views, and illustrations of typical installations. Address AMERICAN WHEELABRATOR & EQUIPMENT CORP., Dept. T&P, Mishawaka, Ind., and ask for Catalog 72-B.
Inform-A-Gram No. B17.

A Fully Diagrammed Circular is available from Morey Machinery Co., Inc., on the 12-M Double Spindle High Speed Vertical Profiler and Milling Machine. This machine rapidly and economically duplicates small parts that require accurate interchangeability. Important features of the profiler are outlined in the circular.
Inform-A-Gram No. B18.

Index Model 55 Improved Vertical Mill has a speed range of 80 to 2700 rpm, combined with a 1 hp drive, 3¼" quill and extra-rugged spindle mounted on oversize precision ball bearings to give a capacity of ⅛" to 1½" end mills in steel. Descriptive literature is available from Index Machine Co.
Inform-A-Gram No. B19.

DI-ACRO Brakes, Benders, shears, rods, parters, punchers and notchers are presented in O'Neil-Irwin's latest, 40-page "Die-Less Duplicating" Catalog. This booklet points out their many applications for experimental work and speedy production of duplicated parts.
Inform-A-Gram No. B20.

An Illustrated, Four-Page Brochure covers the Durant Scrap Chopper. This unit fits any power press with any type of feed; features economical operation.
Inform-A-Gram No. B21.

You Can Now Insert Clinch Nuts in your part as you make it; no other operations are necessary. Clinch Nuts are fed automatically to the piercing station from a hopper and flexible feed chute adjacent to the press. The nut does the piercing; the slug falls through the die button as lips on the die button clinch the nut to the part. Allied Products Corp. will mail detailed Clinch Nut-tooling literature.
Inform-A-Gram No. B22.

Three Hi-Speed Automatic Presses are pictured and described as to operating features, construction, etc., in Di Machine Corporation's latest literature offering. These accurate presses are made in 5-, 8- and 12-ton models, featuring variable speed drive, clutch and automatic brake release, and positive knockout for compound dies.
Inform-A-Gram No. B23.

Style JS Empco Jack is a new device that can save considerable time in setting and keeping equipment level. VI-SORB mounting pads, for absorbing vibration, are available as optional equipment. The jack will support 20 tons and lift 8000 lbs. The Enterprise Machine Parts Corp. will furnish specifications and prices.
Inform-A-Gram No. B24.

A New Technique for Brazing Carbide Tool Tips is described in a pamphlet published by Valley Machinery & Supply Co. It pictures and details operation of the Valley Brazing Unit. Write for a copy to VALLEY MACHINERY & SUPPLY CO., 513 31st Ave., P. O. Box 434, Rock Island, Ill.
Inform-A-Gram No. B25.

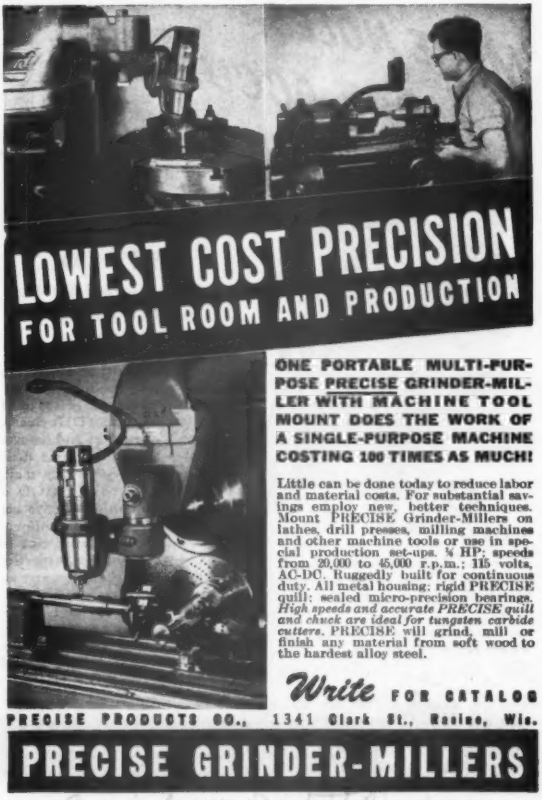
Cincinnati Single Ram Vertical Hydro-Broach Milling Machines are described in detail in Catalog No. M-1389-2. Seven sizes are available, with up to 10-ton broaching force, 66" stroke. This publication shows how to get the full benefit of the surface broaching process.
Inform-A-Gram No. B26.

Excellent Heat Treating Results without polishing or buffing are now obtainable with Phoenix-Brand Non-Scaling Compound, according to a brochure from the manufacturer, The Parker Stamp Works, Inc. Full details are given on this easy-to-use, specially compounded powder.
Inform-A-Gram No. B27.

The Boeckeler Model No. 2 Optical Micrometer offers excellent range, capacity and accuracy, according to a circular from the Tucson manufacturer. Specifications, prices and illustrations are included.
Inform-A-Gram No. B28.

Raymac Solid Carbide End Mills are featured in new Catalog No. 12. These tools are designed for increased production, greater economy and longer tool life. They were developed to cut tough alloys, plastics and non-ferrous materials, and especially stainless steel.
Inform-A-Gram No. B29.

Atlantic Saw Blades meet all the requirements for superior blades on complicated die and fixture radius cutting. The current Atlantic saw blade catalog is now being distributed by the manufacturer.
Inform-A-Gram No. B30.


LOWEST COST PRECISION
FOR TOOL ROOM AND PRODUCTION
ONE PORTABLE MULTI-PURPOSE PRECISE GRINDER-MILLER WITH MACHINE TOOL MOUNT DOES THE WORK OF A SINGLE-PURPOSE MACHINE COSTING 100 TIMES AS MUCH!
Little can be done today to reduce labor and material costs. For substantial savings employ new, better techniques. Mount PRECISE Grinder-Millers on lathes, drill presses, milling machines and other machine tools or use in special production set-ups. ¼ HP; speeds from 20,000 to 45,000 r.p.m.; 115 volts, AC-DC. Ruggedly built for continuous duty. All metal housing; rigid PRECISE quill; sealed micro-precision bearings. High speeds and accurate PRECISE quill and chuck are ideal for tungsten carbide cutters. PRECISE will grind, mill or finish any material from soft wood to the hardest alloy steel.
Write FOR CATALOG
PRECISE PRODUCTS CO., 1341 Clark St., Racine, Wis.
PRECISE GRINDER-MILLERS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

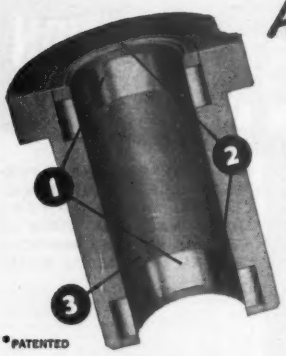
The New Cartridge Type Packing Gland, combining double bearing surface, low friction ram seal and a ram wiper into a single compact unit, is a feature of Pemaco Hydraulic and Air Cylinders. Petch Mfg. Co. will provide complete information and engineering data.
Inform-A-Gram No. B31.

Cam Milling and Jig Boring Services are offered by Eisler Engineering Co., Inc., of Newark, N. J. They also do spot welding, contract production and experimental development. Full data are available.
Inform-A-Gram No. B32.

A Precision Carbide Tool Grinder is the highlight of Baldor Bulletin No. 341-B. This grinder has balanced armature and wheels, runs smoothly on large ball bearings. Other features, fully detailed in the bulletin, include wet or dry grinding, ½ hp, 3400 rpm motor, and 6" silicon carbide wheels.
Inform-A-Gram No. B33.

Many Bending Operations are pictured in Dreis & Krump Catalog P-51. It covers the complete line of Chicago Power Bending Brakes and Power Universal Box and Pan Brakes.
Inform-A-Gram No. B34.

MORE HOLES—
MORE ACCURACY—
FASTER—
AT LESS COST



MEYCO
Carbide Inserted Bushings
Are Doing It Daily!

HOW? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that come close to the prices of ordinary steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for Meyco Bushing Catalog No. 17.

W. F. MEYERS CO., INC., BEDFORD, INDIANA

Carbide Drill Bushings

The Control of Vapor, Mist and Fog from the most common wet machining operations is covered in Bulletin No. 622 of Aget-Detroit. Four pages are devoted to illustrations of various self-contained, unit type collectors that remove the vapor laden air from the machine, extract the vapor from the air and return the cleaned air to the working spaces. Illustrations of typical installations on thread grinders, screw machines, etc., are included. A table compares performance ratings, lists dimensions, motor size, price, etc., of the different collectors available. AGET-DETROIT CO., 213 Main St., Ann Arbor, Mich.
Inform-A-Gram No. B35.

Kipp Featherweight Air Grinders are presented in current Madison-Kipp Catalog AT 3006. Besides covering these cost-cutting grinders, the colorful, 20-page catalog also illustrates and describes various accessories. These include mounted grinding wheels, Kipp Cutters, tool post adapters, etc.
Inform-A-Gram No. B36.

Ace "Star Dust" Diamond Lapping Compounds and Powders provide the subject matter for an informative bulletin. "Star Dust" is accurately crushed and graded to achieve uniform nodular shape, permitting all particles to work. Finishes of less than half a microinch are thus assured.
Inform-A-Gram No. B37.

New Punch Catalog. More than 276,000,000 standard punch sizes and types are now available at standard prices from Pivot Punch and Die Corp. Informative Catalog No. 514 tells the whole story of this new service.
Inform-A-Gram No. B38.

The Heavy Duty No. 150 "Mitl-Mite" is a new magnetic base holder for instantly mounting test indicators to flat or curved surfaces. Detailed descriptive literature can be procured from the manufacturer, Enco Mfg. Co.
Inform-A-Gram No. B39.

An Opportunity to Reduce Fastening Costs is presented in a new broadside issued by Chicago Rivet & Machine Co., This publication describes a double rivet setter, with pneumatic control, that gives an operator the choice of two sets of riveting centers. The change from one center distance to the other is accomplished without interfering with the riveting rhythm of the fastest operator. CHICAGO RIVET & MACHINE CO., 9600 W. Jackson Blvd., Bellwood, Ill.
Inform-A-Gram No. B40.

HARD-N-TUFF Steel Hardening Compound is the subject of a current bulletin. This compound is guaranteed to increase tool life at least 300%. Complete features are described in the bulletin, which also includes testimonials from leading manufacturers. A copy can be had from the distributor, HILLSDOWN SALES CO., 299 Madison Ave., New York 17, N. Y.
Inform-A-Gram No. B41.

The Walls Manual on Finishing contains descriptions of the company's streamlined Standard D-4 Abrasive Band Grinder and other styles and sizes. The portable D-4 unit is equipped with improved band tension control and specially designed protective motor hood.
Inform-A-Gram No. B42.

Precise Grinder-Millers provide accuracy to .0001" for cylindrical, internal, external and form grinding; and for milling with carbide or high speed steel midget mills. A complete, illustrated catalog has been prepared by Precise Products Company.
Inform-A-Gram No. B43.

The Magna-Vise holds any metal or rigid non-magnetic material firmly in place on your present magnetic chuck. It permits you to take advantage of magnetic chucking for brass, aluminum, copper, etc. Hanchett Magna-Lock Corp. is mailing detailed literature.
Inform-A-Gram No. B44.

Scully-Jones Bulletin No. 3-50 contains complete specifications and prices on "Magic" Quick-Change Chucks. With these chucks, you can quickly insert drills, reamers, taps and other tools without stopping spindles. When you raise the locking ring, the collet drops out automatically for a quick, safe tool change.
Inform-A-Gram No. B45.

A New Booklet tells how "Hi-Rockwell" Drills can drill clean, bright, accurate holes in hardened steel with a Rockwell hardness of C34 to C68. Champion Tool Co., Farmington, Mich., is the manufacturer.
Inform-A-Gram No. B46.

P-K Quality-Controlled Self-Tapping Screws are presented in an informative pamphlet. Each type of screw is described as to size and styles. Typical applications for each type are pictured. Write to PARKER-KALON CORP., 200 Varick St., New York 14, N. Y.
Inform-A-Gram No. B47.

The Universal "Masterhead" enables you to do boring, facing, undercutting, recessing and other operations with this one tool and with only one setup. Illustrated literature from Karl A. Neise describes its outstanding features and gives complete technical information.
Inform-A-Gram No. B48.

famco
LEADING MANUFACTURER OF ARBOR PRESSES
OFFERS 32 MODELS . . . BENCH AND FLOOR TYPES

Powerful Famco hand-operated arbor presses are used today in tens of thousands of plants throughout the world. They deliver up to 15 Tons pressure—have gibs for exclusive front and side ram adjustment. These Famco presses add flexibility to production lines because they require no additional power source. Reinforced semi-steel frame castings, alloy steel rack and pinion. See your dealer, or write for literature.

FAMCO MACHINE CO., 1344 18th St., Racine, Wis.
famco (COST CUTTING) machines
ARBOR PRESSES • DRILL PRESSES • METAL CUT-OFF SAWS
POWER PRESSES • FOOT PRESSES • SQUARING SHEARS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

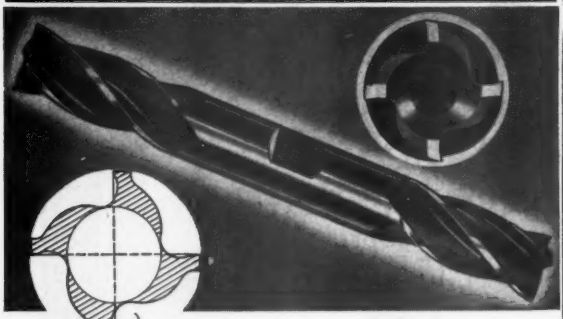
Solid Carbide Blanks, precision machined to exacting customers' specifications, are a specialty of Stellram Tungsten & Molybdenum, Ltd., of Switzerland. Complete information is obtainable from the American representative, Sintered Carbide Corporation, of New York City.
Inform-A-Gram No. B49.

The WLS Speedtooling Method of producing precision stampings with low tool charges is detailed in a four-page bulletin prepared by WLS Stamping Company.
Inform-A-Gram No. B50.

The Square Design of Miller Air and Hydraulic Cylinders saves up to 25% of mounting space, permitting more cylinder power in the same space and easier, more convenient installation in "tight spots." Illustrated Bulletins A-105 and H-104 are available from the manufacturer, Miller Motor Company.
Inform-A-Gram No. B51.

Diamonds and Long Drills are among the inexpensive items described in the 128-page catalog offered by Eastern Tool Supply Company.
Inform-A-Gram No. B52.

YESTERDAY'S PIONEER . . . TODAY'S LEADER



Chips Curl Out Instead of Clogging with WELDON Cupped-End End Mills

● Over twenty-five years ago Weldon opened the door to higher speeds and faster feeds by developing a scientifically designed end mill tooth. This hollow ground tooth with its curved cutting face allows the chips to *curl* out without clogging. A further means to this purpose is the Weldon "cupped-end" which prevents chips from clogging the teeth ends because it eliminates pockets which trap chips.

Another special feature originated by Weldon is the double back-off on the tooth, which gives greater support to the cutting edge, prolonging the life of the tool.

Visit us at our Booth at A.S.T.E. Exposition, March, 1952.

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

A New Chuck Catalog is obtainable from Sutton Tool Co. This eight-page, two-color booklet contains cross section views of the gripping power and fast action of the Levermatic Collet Chuck and shows a number of standard and special applications with descriptions. The Handimatic Collet Chuck is also covered in the catalog. SUTTON TOOL CO., Dept. T&P, Sturgis 2, Mich.
Inform-A-Gram No. B53.

Nichols Millers handle a complete range of conventional milling, both horizontal and vertical. Versatile rise and fall spindle heads can be locked in fixed position—or floated for profiling, broaching, drilling, keyseating and similar plunge-cutting operations. Rapid lever feeds speed up many lathe-type operations such as turning, facing, boring and recessing. Literature can be had from Nichols-Morris Corp.
Inform-A-Gram No. B54.

"John's" Drill Jigs shorten setup time, save on tooling costs and speed up production on many drilling, tapping, boring, milling and grinding operations. They are made by Heuser Mfg. Co. in three standard sizes: 6", 8" and 14". Descriptive literature is obtainable.
Inform-A-Gram No. B55.

The Versatile Combination Set is featured in Tubular Micrometer Company's latest catalog. This tool can be used as a try square, miter square, height gage, marking gage, depth gage, center finder, protractor, bevel gage, scriber, level, steel rule and straight edge.
Inform-A-Gram No. B56.

An Interesting Dumore Bulletin shows typical applications of the company's economical Handgrinder, illustrates a full range of sizes 1/40 to 1/4 hp. It details outstanding features such as preselected bearings and dynamically balanced armatures.
Inform-A-Gram No. B57.

Precision Die Sets, die springs, leader pins and bushings, stripper bolts, screws and many other accessories are described in the 112-page catalog, designated No. 50, issued by E. A. Baumbach Mfg. Co. Such modern improvements as demountable leader pins and bushings are detailed. This is an important time and labor saving feature because operations like counterboring, regrinding or machining become routine after the leader pins and bushings are removed.
Inform-A-Gram No. B58.

Reltool's Extensive Catalog 50 illustrates the company's complete line of arbors, dovetail cutters, end mills, counterbores and other tools. A feature of the line are the shank type dovetail cutters. They can be used in place of arbor-type and threaded-hole angle cutters, and are excellent for milling dovetails with less setup time and easier handling.
Inform-A-Gram No. B59.

Vertical Milling Machine. Fray's No. 10-R Universal Ram Turret Type machine is presented in Bulletin 10. With this miller, you can machine at any angle—vertical, horizontal or both. You can also mill, drill or bore at any angle.
Inform-A-Gram No. B60.

The Dremel Electric Moto-Tool is known as the "pocket-size machine shop." It is used for polishing and grinding dies, burring parts, sharpening cutters, etc. A detailed catalog is available from Dremel Mfg. Co.
Inform-A-Gram No. B61.

Mirror Finishes in Minutes instead of hours can be obtained with "Micro Mesh" Pure Diamond Compound. A-1 Laboratories offer complete liteature and details.
Inform-A-Gram No. B62.

Hand Knobs, hand wheels and machine handles are covered in a four-page brochure from Tomco Products Company. Complete dimensions are given.
Inform-A-Gram No. B63.

The Protectron Damage Control System, described in a Brinnell Company bulletin, is especially useful in decreasing die breakage and increasing die life between grinds. This bulletin describes the operation of the Protectron system and contains several application photos.
Inform-A-Gram No. B64.

Special Boring Bars for precision work come equipped with standard Microbore tools from DeVlieg Microbore Co. An illustrated catalog provides full particulars.
Inform-A-Gram No. B65.

"Pantography," a George Gorton Machine Co. publication, fully explains this process and shows what Gorton Tracer-Controlled Pantographs can do for you. With these special machines, literally thousands of operations can be speeded up, improved in quality and lowered in cost.
Inform-A-Gram No. B66.

The Latest Kempsmith Arbor Bulletin describes the company's extensive line of arbors and accessories. It also gives helpful tips on how to keep your arbors in peak condition.
Inform-A-Gram No. B67.

BIGGEST VALUE
IN
TOOL and CUTTER GRINDERS
TODAY!

Will Do Anything That Machines Costing 2 or 3 Times More Will Do

Distributed Only Through Franchise Dealers

K. O. LEE CO.
ABERDEEN S D

See Your Authorized "K-O" Distributor Or Write For Descriptive Literature

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

A Handy Listing of bronze maintenance bars can be found in a folder from The Buckeye Brass & Mfg. Co. Complete sizes are listed for 13" length bronze maintenance bars and fully machined solid bars. THE BUCKEYE BRASS & MFG. CO., 6410 Hawthorne Ave., Cleveland 3, Ohio.
Inform-A-Gram No. B68.

The Buck "Ajust-Tru" Chuck permits .0005" precision with scroll chuck rechucking speed. It handles all collet and step collet work. Buck Tool Company is sending out a detailed bulletin on this production-boosting chuck.
Inform-A-Gram No. B69.

Anyone Can Read the new Central Read-Rite Micrometer. Numbers that automatically appear on the thimble, as you adjust the micrometer, eliminate the computations usually required in taking a micrometer reading. This and other measuring tools are shown in The Central Tool Company's 12-page, illustrated Catalog 30.
Inform-A-Gram No. B70.

"Precision Grinding by Reid" is a three-color folder featuring Reid Model 618 Precision Surface Grinder. Variable table speeds of 12 to 35 fpm are a highlight of this machine.
Inform-A-Gram No. B71.

ARMSTRONG
Carbide
TOOL HOLDERS

FOR HIGHER SPEEDS, AND HEAVIER FEEDS

ARMSTRONG Carbide Tool Holders and ARMIDE (Carbide Tipped) Cutters come in cased sets for tool rooms and maintenance departments, and individually in all sizes for general machine shop and production turning. They permit not only the ready machining of sand-filled castings, the hardest and toughest steels as well as many heretofore "unmachinable" materials, but also make practical much heavier cuts and cutting speeds up to 600 f.p.m. on ordinary work. They also run from 10 to 100 times as long between regrindings.

WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5220 W. ARMSTRONG AVENUE, CHICAGO 30, U. S. A.
NEW YORK SAN FRANCISCO

The One Engineering Principle in a collet that improves the durability, assures predictable performance and enables a collet to increase its lifetime production, is described in a brand-new Balas Collet Mfg. Co. publication. This brochure details the advantages of Balas' Cam-Ground, Clover Leaf Collet, which incorporates the all-important principle of exerted power. BALAS COLLET MFG., CO., 1559 E. 27th St., Cleveland 14, Ohio.
Inform-A-Gram No. B72.

The Collins "Micro-Flat" is a new black granite surface plate finished up to 50 millionths of an inch. List prices, sizes, illustrations and full information are given in a current, four-page folder. COLLINS GRANITE SURFACE PLATE CO., 2326 E. Eighth, Los Angeles 21, Calif.
Inform-A-Gram No. B73.

The Leitz Projection Orthometer makes use of a new optical method to speed up inspection and to permit more than one person to view the scale simultaneously. A new guide, "Optical Measuring Methods," is offered by the distributor, George Scherr Co., Inc.
Inform-A-Gram No. B74.

GEMCO Precision Shaper Booklet. Three types of GEMCO shapers — universal, production and plain—are pictured in Bulletin D, now procurable from General Engineer & Mfg. Co. All are LUBRIGARD protected.
Inform-A-Gram No. B75.

Series 1600 Electric Furnaces are the subject of Thermo Electric Mfg. Company's handy reference file. These heavy-duty models are excellent for heat treating of tools, dies and parts, and for general laboratory work.
Inform-A-Gram No. B76.

"Step Up Production" is Minnesota Mining & Mfg. Company's highly illustrated, 36-page booklet that shows how 3-M belt grinding cuts costs.
Inform-A-Gram No. B77.

An Illustrated Folder on welding, brazing and cutting steel with torch and arc has been released by All-State Welding Alloys Co., Inc. Contained are complete instructions for use, techniques of application and description of the properties of 12 alloys for welding and brazing and one alloy for cutting, particularly developed for use on all types of steel. ALL-STATE WELDING ALLOYS CO., INC., 273 Ferris Ave., White Plains, N. Y.
Inform-A-Gram No. B78.

A New 76-Page Aro Air Tool Catalog, the largest ever published by the company, covers the complete line of Air industrial air tools and accessories. All standard tools plus many new ones are shown. All tools are grouped in sections — grinders, screwdrivers, drills, etc. Write to ARO EQUIPMENT CORP., Dept. T&P, Bryan, Ohio, and ask for Catalog No. 60.
Inform-A-Gram No. B79.

Late Model Lucas Boring Mills feature automatic power positioning, integrally cast, four-way beds with 4-point support, a complete range of feeds and speeds to one spindle, pendant control and vibrationless V-belt drive to spindle at high speeds. Complete details can be had from Lucas Machine Div., The New Britain Machine Co.
Inform-A-Gram No. B80.

Erickson Precision Collet Chucks are presented in Catalog J. These chucks are said to grip along the entire length of collet; replace seven standard single-purpose collets; grip on drill flutes; permit stubbing and use of broken drills. Many other advantages are pointed out in the catalog.
Inform-A-Gram No. B81.

Atlas-Clausing 12" Lathes have many outstanding construction and performance features. Detailed catalogs on the 4800 and 6300 Series are now obtainable from Atlas Press Co.
Inform-A-Gram No. B82.

U. S. Automatic Press Room Equipment is featured in a catalog brought out by the New Jersey manufacturer. It describes and pictures slide feeds, roll feeds, stock straighteners, stock reels and coil cradles—all designed for improving stamping operations.
Inform-A-Gram No. B83.

One Acme All-Purpose Tool Holder can be used instead of ten, according to new literature from the manufacturer. This tool holder can be used for internal boring or internal threading, is excellent for carbide tools.
Inform-A-Gram No. B84.

Long-Lasting ABC Bushings are made from steel containing chromium and/or tungsten. These accurate and concentric drill jig bushings are available in four standard types. A descriptive catalog has been released by the manufacturer, Accurate Bushing Co.
Inform-A-Gram No. B85.

A Labor-Saving Device for the detail marking of name plates is the "Automark" Automatic Electric Metal Marking Typewriter. It is all-electric, with automatic table feed. Cadillac Stamp Company will provide a descriptive bulletin.
Inform-A-Gram No. B86.

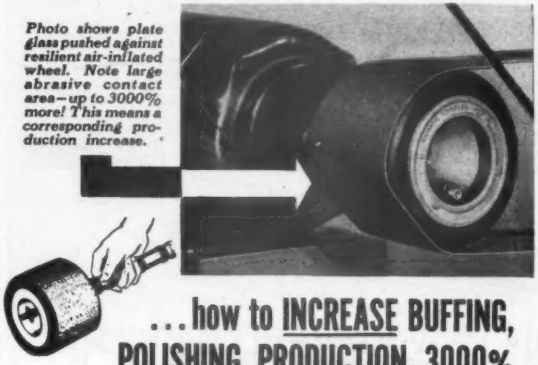


Photo shows plate glass pushed against resilient air-inflated wheel. Note large abrasive contact area—up to 3000% more! This means a corresponding production increase.

...how to INCREASE BUFFING, POLISHING PRODUCTION 3000%

● You can boost your buffing and polishing output up to 3000% on flat work ... and 600 to 700% on contours ... by using this resilient air-inflated wheel. Many other advantages such as—*no chatter or bounce ... eliminates under-cuts ... produces a straight pattern similar to a hand finish.* For use on portable tools or bench-stands—wherever ordinary polishing wheels are used. Send NOW for free literature and name of distributor nearest you. Nu-Matic Grinders, Inc., 8225 Carnegie Ave., Cleveland 3, Ohio.

send for full information TODAY!

NU-MATIC Air-Inflated GRINDERS

grinder accessories

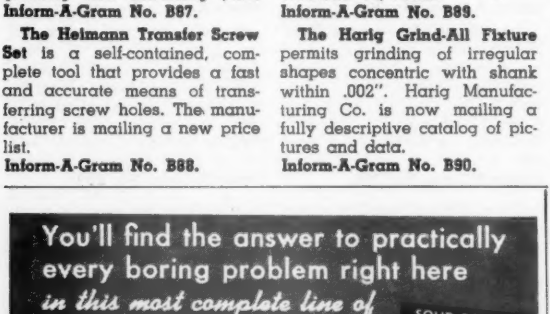
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Onsrud Air Turbine Grinders are featured in Bulletin 1129 from the Chicago firm. These portable tools are designed for vibration-free operation that reduces operator fatigue. The bulletin tells how the three Onsrud models can speed grinding and deburring jobs.
Inform-A-Gram No. B87.

The Heimann Transfer Screw Set is a self-contained, complete tool that provides a fast and accurate means of transferring screw holes. The manufacturer is mailing a new price list.
Inform-A-Gram No. B88.

A New, Profusely-Illustrated Bulletin covers the Comtorplug Internal Gage. Bulletin No. 46 clearly pictures how to use Comtorplug, describes features, and contains details on parts, sizes, prices. Address THE COMTOR CO., 182 Farwell St., Waltham 54, Mass.
Inform-A-Gram No. B89.

The Harig Grind-All Fixture permits grinding of irregular shapes concentric with shank within .002". Harig Manufacturing Co. is now mailing a fully descriptive catalog of pictures and data.
Inform-A-Gram No. B90.



These unique tools, distinguished by their helical form, are available in high speed steel, carbide-tipped and solid carbide in three styles: A (for general boring), B (for bottoming and facing) and C (for internal threading)—in a wide range of sizes from 1/16" dia. up.

Bokum is always ready to help you with your boring problems.

In addition, there are many accessories here to make applications of Bokum Boring Tools most efficient.

Send for catalog sheets for detailed information about these various tools.

BOKUM TOOL CO.

TRADE MARK REG. U. S. PAT. OFF.

SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

DEPT. E • 14775 WILDEMERE AVE. • DETROIT 21, MICH.

Steel Shop Equipment in the Hallowell line is described in a new folder prepared by Standard Pressed Steel Co., Included are pictures, details and shipping weights of cabinet benches, work benches, bench legs, drawers, shop desks, cabinets, tool stands, carts, stools and chairs. Address STANDARD PRESSED STEEL CO., Box 36, Jenkintown, Pa.
Inform-A-Gram No. B91.

The "Bendit" Metal Forming Machine bends, folds, shapes and duplicates intricate as well as simple metal products and components. This machine is fully described and well illustrated in new Catalog 15, available from KILHAM ENGINEERING INC., 1412 Packard Bldg., Philadelphia 2, Pa.
Inform-A-Gram No. B92.

No Extra Accessories are needed with Webber's Heavy Duty Gage Block Sets. These blocks can be combined into plug, ring or snap gages with accuracy in millionths. The Webber Gage Company's recently issued catalog gives complete details.
Inform-A-Gram No. B93.

Air-Operated Dial Feed Tables are the subject of The A. K. Allen Company's newest illustrated brochure. Models 11EA and 11EB have completely enclosed working mechanism, rack and gear drive, and flame hardened working parts.
Inform-A-Gram No. B94.

"Safety Plus" Socket Screw Products, cap and set screws, nuts, taper pins and studs are designed by The Chicago Screw Company to provide a tight, low-cost fastening for any heavy-duty purpose. Literature can be had upon request.
Inform-A-Gram No. B95.

"Quality" Dies, completely and exhaustively inspected at every step in the die-making process to make sure that the dies are right, are the subject of recent Quality Hardware & Machine literature.
Inform-A-Gram No. B96.

Boring Bars: Steel

Boring Bars: Carbide

Dickerman's 3" Die Feed is easy to install, has no complicated parts to get out of order, according to literature from the New England manufacturer. This feed can be mounted on die set or bolster plate to feed from any direction. It feeds coiled materials such as steel, copper, brass, aluminum, etc., and will handle stock of any practical combination of thicknesses up to 3/16" and width to 4" or 6".
Inform-A-Gram No. B97.

C-O Cincinnati Drilling Machines make up the subject matter of illustrated Catalog D-108, just out. This publication lists outstanding features and specifications of the 16" 3000 Series Sliding Head, Box Column Floor and Bench Models of single and multiple spindle drills. Write CINCINNATI LATHE & TOOL CO., Canedy-Otto Div., Dept. T&P, Oakley, Cincinnati 9, Ohio.
Inform-A-Gram No. B98.

Morton Fixture Clamps and components highlight the latest, 72-page Morton Machine Works catalog. The complete line is shown in this publication, which also includes full size templates for tracing purposes.
Inform-A-Gram No. B99.

Putnam's 116-Page End Mill Catalog. No. 52, is now available. It lists over 1000 sizes and types of fast cutting, long lasting end mills. There are many additions to the line, including the new Positiv-Lok series.
Inform-A-Gram No. B100.

Fractional Horsepower Gearing is featured in a six-page folder from Gear Specialties. Fifteen different types of small gears are pictured, G.S. facilities are described and handy standards charts are included.
Inform-A-Gram No. B101.

Ex-Cell-O's 80-Page Spindle Catalog contains extensive information and many illustrations on precision grinding spindles.
Inform-A-Gram No. B102.

Royal Oak Tool & Machine Co. offers its latest D-S Grinder Catalog. The D-S Radial Relief Grinder is available in hand-operated and motor-driven models for producing better-cutting, longer-lived taps, counterbores, step drills, center drills, etc.
Inform-A-Gram No. B103.

With Spiral Step Tools, you can drill multi-diameter holes and countersink and chamfer in one operation. Each tool is made special for the job to be done. Spiral Step Tool Co. is mailing its new Bulletin No. 101.
Inform-A-Gram No. B104.

Hardened and Ground HSS Blanks in any decimal diameter to ½", and in any length, are covered in Price List D-3 from William T. Hutchinson Co. These blanks are particularly applicable for punches, gages, measuring wires, and special tools.
Inform-A-Gram No. B105.

The Magna-Eye for height gages and vernier calipers magnifies the "hard-to-read" scales, permits them to be read with ease and without eye strain. Complete information is procurable from Stebar Company.
Inform-A-Gram No. B106.

Trimming Formed Parts
AND HUNDREDS OF OTHER
CUTTING JOBS are FRICTION SAWN
QUICKER and BETTER
with **Tannewitz**
HIGH SPEED BAND SAWS!

Get your FREE COPY OF "FRICTION SAWING"

Friction sawing with Tannewitz High Speed Band Saws is much faster, easier and better than any other method of cutting formed parts, flat sheets of either soft or hard steel, non-ferrous metals, glass, plastics and many other materials. Down-drag of saw is so little that no rest of any kind is needed in trimming formed parts or castings. Savings in time and costs are immense.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

. . . Work Handling, from page 154

saving can be effected in cost of steel. Heavy-duty coil cradles for use in connection with these hydraulic feeding and straightening machines may be readily obtained.

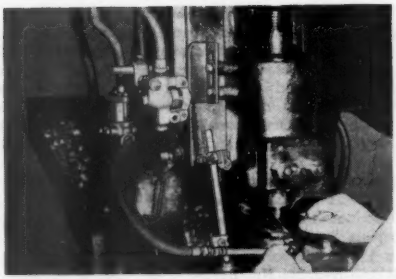
Interesting and out-of-the-ordinary aspects of feeding in connection with coil strip are sometimes found. In some instances, stainless steel strip has paper wound in the coil with it, in order to protect the surfaces of the steel. A convenient means of getting rid of the paper strip sometimes poses a problem. One interesting thing that has been done along this line is to arrange a pipe in convenient position, and to thread the end of the paper tape into the pipe when the press operation is started. Then, by using a continuous blast of compressed air, in such manner as to induce the paper tape to proceed through the pipe and from its end into a waste container positioned to receive it, disposal of the paper strip is completely automatic, along with the regular press feed.

Continuous Coil Strip Often Re-Wound

In many cases where coiled strip is being processed through a press by means of automatic feed, a blanking operation is such that a continuous strip of waste material emerges from the die. In some cases, a special scrap chopper is installed on a press, which automatically cuts this strip up into lengths more readily handled. However, many prefer to use a winder on the outfeeding side of the press, which automatically winds continuous scrap material into coiled form, for handling and disposal.

Whether continuous strip emerging from a press is scrap or finished product, a winder can be used in this manner to re-wind the material. As used by some, the drive for these winders is through an adjustable friction device. This adjustable friction drive may be set to maintain desired tension on the stock. This is accomplished through a control arm, terminating in a roller which lies on the top surface of the stock being wound. This control arm raises as the tension increases, and lowers as it decreases. Through the raising and lowering of the arm, the winder stops and starts.

While counting devices applied to punch presses are not definitely handling units, they are closely interrelated with the handling process as to be worthy of mention. Many fine stroke counters are in use on many presses in conjunction with various types of automatic feeds. There is a counter available for every type of press. A pre-determined counter may be employed if desired, and set to a pre-determined total of pieces to be produced. When that number is reached, a self contained switch is actuated which shuts off the press, lights a light, or rings a bell.



This installation of piping, ram-actuated valve, and filter, results in efficient air ejection of workpieces from small press. The blast of air blows the pieces directly into a container.

Save Work on Large-Lot Runs

Such a counter is ideal for use on presses which use roll feeds on large quantity orders, because it enables one operator to handle several presses, yet to produce only as many pieces as are called for on each order. Some stamping plants prefer to bring their count from a press department into a production or time-keeping office.

With this system, the man in charge knows at any minute of the day how far along they are on the production of a particular part. Further, should a machine stop due to trouble, it is immediately known in the production office, since the counter stops counting. This type of installation is accomplished by attaching to the press a switch, or actuator, which closes the circuit on a line leading to an electric counter in the office. This same type of installation is used on deep draw presses when the necessary linkage for a mechanical counter would be too complicated or expensive. A recent development for press counting consists of a

(Continued on page 174)

● SOCKET SCREW PRODUCTS
● CAP and SET SCREWS
● NUTS • TAPER PINS • STUDS

Chicago "Safety Plus" Screws are designed to give you a tighter, lower cost fastening for any heavy duty purpose. To speed delivery time, call the INDUSTRIAL SUPPLY DISTRIBUTOR nearest you today. Ask for Chicago and get "Safety Plus."

THE CHICAGO SCREW COMPANY
2514 WASHINGTON BLVD. • BELLWOOD, ILL.

---

job-tailored to your tooling...

E & G COMPOUND BASE

the only work-table offering 6" lateral and 4" transverse continuous micrometer motion, reading direct to 1/10,000"

a highly versatile tool for precision machine work and inspection, the Compound Base equipped with the microscope of your choice becomes a complete Toolmakers Microscope... mechanically unsurpassed and optically job-tailored to your particular needs!

for literature write direct to:

ERB & GRAY

854 South Figueroa Street
Los Angeles 17, California

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Quality Control, from page 140

ed and most of the various border wire formations are made on air and hand-operated forming tools. A typical operation is shown in Figure 19. First is shown an operator with a wire which is in position, air locked and partly formed. The center picture shows additional forming by hand and the third is the removal of a finished piece and the positioning of a new wire.

This typical part is then checked on the gauge shown in Figure 20, and the chart is filled out. There are no control limits placed on this chart for most of the mistakes are due to operator failure and as such do not occur in random order. However, it is desirable to record the results of the inspection so that operator skill can be evaluated or any specific defect in the fixture can be detected.

Finally, from the various charts described previously a weekly graphical resume is compiled by the Quality Control Department for Management. On this chart, Figure 21, are indicated a continuous record of the amount of scrap, the overall quality of the product determined from the "X", "R" and "np" charts and a summary of rejections received.

To evaluate the accomplishments of the use of Statistical Quality Control methods, Figure 22, charts the comparative hours of clerical work, the number of inspections per seat unit, and the amount of scrap from the beginning of the Statistical Quality Program through the transition period to complete quality control. It is noted on the clerical work graph that the hours increased considerably at the start of this program. However, this was due to some extent to the number of hours of training in statistical methods and the newness of the entire program. Although the cost of inspection per seat has increased somewhat, the amount of inspection per seat has increased twice as much, with production schedules at the same level they were before Statistical Quality Control.

It is possible that our inspection intervals are subject to some increase while retaining the current standards of quality. The amount of scrap, although it increased shortly after the introduction of Statistical Quality Control, has in general been decreased and the upsurge at the beginning was due to the new emphasis on quality before the system could be completely applied.

In conclusion, The Universal Wire Spring Company Management feels that

Drill a maximum number of holes in one pass—in any material. Holes can be as close as twice drill diameter. Zagar gearless drillheads are built as a complete unit or may be adapted to any standard drill press. Send us your part drawing and we will submit our quotation.

Write for Manual T-3.

ZAGAR TOOL, INC., 24000 Lakeland Blvd., Cleveland 23, O.

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

the use of Statistical Quality Control and the proper records of this control have been distinctly beneficial in the following respects:

1. The Management's satisfaction in knowing on a daily basis that its products are being shipped to the customer with the highest level of quality attainable.

2. Records and charts showing the quality of product on an hourly and daily basis instill in each employee a pride in workmanship and an interest in the quality of the items they are producing. This was unknown when there was no way for them to readily evaluate how good or bad was the product they were making.

3. A reduction in operating costs through lower quantities of scrap and a reduction in maintenance costs due to aimless machine adjustment.

4. The probability of increased inspection per seat at a lower cost of inspection per seat.

★ ★ ★

PACKAGING EXHIBIT

A packaging workshop on wheels is making a nationwide tour of military establishments and defense plants to teach personnel of both the Armed Forces and private industry some of the latest methods of protective packaging. The specially designed, 40-foot mobile workshop is staffed by technically trained personnel of Reynolds Metals Company, which is sponsoring the tour in collaboration with the Armed Forces.

The little workshop, with its built-in power-generating plant and latest labor-saving devices, shows the most advantageous uses of aluminum foil for military packaging.

Complete information on the tour's itinerary is available upon request from Reynolds Metals Company, 2500 South Third Street, Louisville, Kentucky.

FOUR STATES MACHINERY COMPANY, 5304 West Chicago Avenue, Chicago 51, Ill., and 606 West Wisconsin Avenue, Milwaukee 3, Wis., was recently organized by Walter J. Murphy, Robert R. Heidemann, Davis Asmus, John B. Laing and James D. Baillet, for the purpose of representing several machine tool manufacturers in the Chicago and Milwaukee areas.

Among the manufacturers represented by Four States are: Cincinnati Shaper Company; Federal Press Company; Globe Tool & Engineering Company; Kane & Roach, Inc.; Kaufman Mfg. Company; Reed-Prentice Corporation, and Webb Corporation.

The territory covered by Four States includes Illinois north of Springfield, Wisconsin except for the northwest section, eastern Iowa, and the northern tire of counties in Indiana.

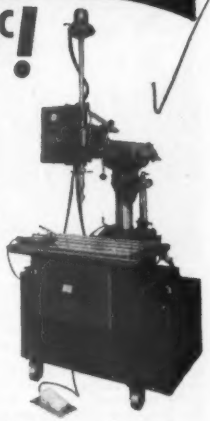
The new organization represents over 56 man years of past experience in the machine tool selling field.

You can salvage Valuable Parts—

—FOR LESS THAN 25¢!

Including Labor, Materials, Burden

Elox Electron Drills* are production machines designed for fast removal of broken taps, drills, studs, etc., without harm to thread or wall, sticking or welding. Most units are completely self-contained, easily transported and come ready to plug in. As simple to operate as any drill press, Elox Electron Drills* are an insurance against loss of time, money and materials. Throughout the world, Elox machines salvage millions of dollars of work each year. Check your scrap today. There's an Elox Electron Drill* priced for any industrial requirement. Write today.



ELOX CORPORATION OF MICHIGAN
741 N. Rochester Rd.
Clawson, Michigan

Western Division: Box 27 • Englewood, California

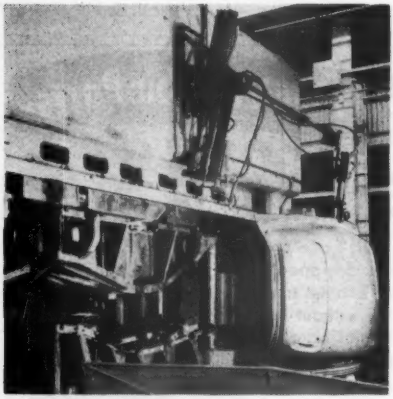
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Metal Disintegrator

. . . Work Handling, from page 170

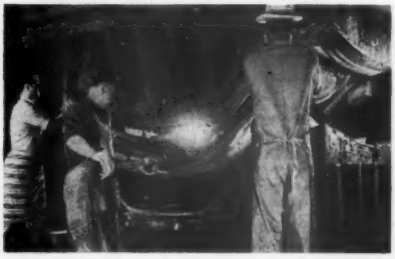
mechanical counter which gives a printed record of pieces produced.

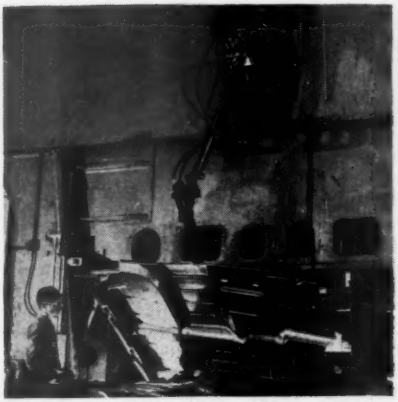
What has been said to this point has been chiefly in consideration of feeding work into the press. However, handling work out of the press and handling it immediately after discharge from the press are also important. First in this respect, no doubt, is actual ejection of work from the die and machine. In some cases, mechanical ejectors can be arranged. In many instances, a fine job of ejecting either work or scrap is accomplished through use of compressed air ejection devices.



The view above, from an automobile plant, shows a large press equipped with special press unloader known as the "iron hand." This Sahlin automatic press unloader is in action lifting a 75 pound auto roof out of the drawing die.

In the view below and by way of contrast, prior to use of the automatic "iron hand," three men were required to dig a heavy car roof out of the die and carry it to table by trim press.





This view shows an automatic press unloader or "iron hand" lifting a heavy automobile floor pan out of a forming press. When a press is down, the "iron hand' is easily transferred to another press for automatic handling of the work.

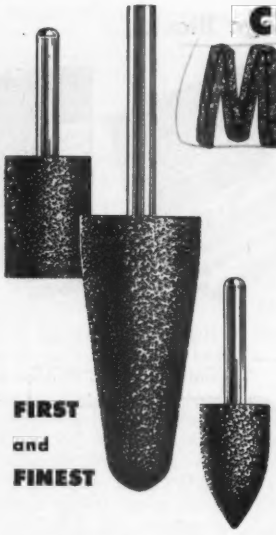
Ejection by Air Blast

Compressed air ejection sets of different types may be and have been installed. One ejection set incorporates a blow valve that is actuated by a roller tripper, attached to the ram of the press. This device can be adjusted to trip the blow valve during the up stroke, at that particular point in relation to press ram motion when the work is most readily ejected.

On the other hand, cam operated ejection sets are sometimes installed, in connection with an air-saving pilot valve. This valve is adjustable, and can be timed to deliver intermittent blasts of air (at air line pressure) of 1/10-second duration, or from this point to as long as required, then automatically shut off. Where this method is used, work may be ejected at any time during the cycle, or after, when the part is carried up by the ram, or when it tends to stick in the upper die. Use of this method eliminates need for a steady blast of air. In consequence, it saves compressed air and reduces cost of ejection.

In this case, the blow valve is operated by an adjustable cam fitted to a crankshaft, or to any other member making one revolution per cycle. When the blow valve is tripped, it delivers a shot of air

(Continued on page 178)



FIRST and FINEST

CHICAGO Mounted WHEELS

10 Big Advantages

1. First in the Field — Unexcelled "Know-How"
2. Stronger Mandrels — Special Analysis Steel
3. Wheels Guaranteed to Remain on Mandrels
4. Constant Concentricity for Perfect Balance
5. Widest Variety of Sizes and Shapes
6. Strongest Construction for Longest Life
7. Greater Cutting Freedom — Faster Cutting Action
8. Better, Finer Finishes Positively Assured
9. Job-Engineered to Your Particular Requirements
10. Recommended by Skilled Mechanics and Craftsmen

Free Sample Wheel

Give details of your operation. We'll supply correct sample. No obligation. Write for Free Catalog.

CHICAGO WHEEL & MFG. CO.

Dept. TP • 1101 West Monroe Street • Chicago 7, Illinois

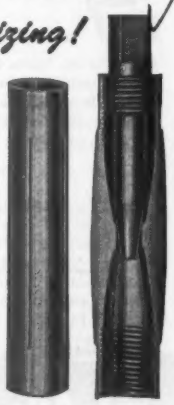
Flexolap... INSTANTLY AND ACCURATELY ADJUSTABLE FOR FAST CUTTING AND POLISHING

...without danger of galling or seizing!

The Flexolap barrel is made with a series of longitudinal slots milled "off-center" to permit sensitively flexible expansion up to 15% — or more — under pressure of the adjusting pin. This construction enables Flexolap to save valuable time and to lap rounder, straighter holes. For accurate precision take-up, as desired, to maintain size and compensate for wear on barrel ... simply turn adjustment screw.

Illustrated at left is Set No. 1. Six sizes (3/16", 1/4", 5/16", 3/8", 7/16" and 1/2") with six brass and six steel barrels on wood stand, complete.....$12.75

Also available in sizes 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16" and 3/4". For lapping holes smaller than 13/16", use the *Midget Lap*. Seventeen sizes: .032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218, and .250. Trial assortment (17 laps).....$1.95



Write today for complete particulars

FEDERAL TOOL CORP. 3600 Pratt Blvd., Chicago 45, U. S. A.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Solid Carbide Precision Gage Blocks

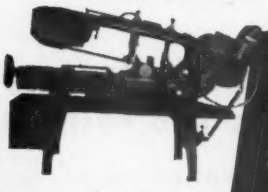
Both USA and Hoke precision gage blocks are now being produced in solid carbide by Pratt & Whitney, Division Niles-Bement-Pond Company. Because of the extremely long wear life of carbide, these blocks will retain their original accuracy many times longer than conventional steel blocks. One-inch blocks and smaller are accurate to a tolerance of plus .000004" and minus .000002". In sizes over one inch, the blocks are accurate to the same tolerances per inch of length.

The USA blocks are rectangular, while the Hoke blocks are rectangular. They are offered in sizes .050" through 4" and are available either in sets, individually to replace worn steel blocks, or as wear blocks in sizes .050" and .100".

An illustrated circular on P&W solid carbide precision gage blocks can be procured by addressing PRATT & WHITNEY, Div. Niles-Bement-Pond Co., 15 Charter Oak Blvd., W. Hartford 1, Conn., or by circling **Inform-A-Gram No. D3.**

5 BIG REASONS

Why Wells Band Saws slash metal cut-off costs



1. Fast, Accurate Action
2. High Job Productivity
3. Low Operating Cost
4. Real Blade Efficiency
5. Long, Dependable Service

Above is the Wells No. 8, shown with wet cutting system. It offers a capacity of 8" x 18", rectangular, 8" dia., rounds.

YOU are always ahead when you handle your cut-off jobs on "Wellsaws." The Wells Band Sawing method will not only reduce your operating costs, but also give you greater job efficiency — better cuts, and real dependable service. There is a size and type for every need and every budget. Capacities range from 3½" x 6" to 48" x 48". Write for descriptive literature.

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1940 CEDAR ST., THREE RIVERS, MICH.

Du Pont Company Fellowships

The award of 75-post-graduate fellowships to 47 universities, and grants-in-aid to 15 universities to "stock-pile" knowledge through the support of fundamental research, has been announced by the Du Pont Company, Wilmington, Del.

An authorization of $510,000 was provided by the company for these and other awards.

These grants are for unrestricted use in the field of fundamental chemical research. The Du Pont awards in recent years have been so successful in furthering this work that the company decided to raise the yearly contribution to each of the ten universities that received awards for the present academic year and to make new grants to five others.

. . . Forging Plants, from page 157

We can't win him over by running wide open on safety one day and forgetting all about it the next. It's easy to win him over but we must prove to him that we really mean it if we want to keep him thinking safely.

To summarize we can say that:

1. Forge plants are hazardous, but need not be nearly as much so.

2. Tradition in the background is misleading. Let's look ahead and tailor-make the tradition of tomorrow.

3. Let's be consistently sincere about wanting safer plants. If we want them badly enough, we can have them.

4. Let's work through good, well informed supervision to the employe. He's our boy and all safety work that is done and all safety policies that are formulated are in his behalf.

5. Let's use guards wherever possible. Guards are positive. They are made of steel and never make mistakes.

6. Let's clean our plants up and keep them clean. Paint, when applied properly, boosts the morale of everybody in a plant.

INTERNATIONAL TRADE FAIR

The 30th Annual International Trade Fair of Milan, Italy, now one of the most important samples shows in the world, will be held from April 12 through 27, 1952.

In 1920 the Fair had its first edition in some 250 wooden huts in the outskirts of Milan with 1233 exhibitors, among them 256 foreigners.

In 1951, notwithstanding the damage suffered during the war, the exhibition covered 1,991,340 square feet of space. Exhibitors numbering 9173 presented their products, among them 3045 belonging to 48 foreign countries. The 1951 attendance numbered 4,200,- of which 41,247 were foreigners from 93 nations.

This year the Fair grounds will cover 3,596,-176 square feet and the front of the various booths and stands exhibiting samples will extend itself along 27 miles.

Among the new features, a spacious section will be reserved for products that were exhibited in an insufficient space in the past. These include ceramics and glassware, silver and gold items, injection molding machines, motorboats and others.

VISUAL GRIND
Now a Veteran...
Tested, Proven, Successful—
IN MANY PRODUCTION PLANTS!
Continuous inspection unites with blind, straight-through and templet grinding by projection during the grinding period. This complete speedy machine handles a wider range of work than ever before. Difficult jobs in steel and tungsten carbide which required several machines are dispatched with ease and profit on Visual-Grind. Tolerances and accuracy are progressively controlled by visual reference. A precision optic system gives trueness and definition. Husky construction insures rigidity and long life.
Ask for Bulletin T-3.
VISUAL GRIND
THE CLEVELAND GRINDING MACHINE CO.
1643 EDDY ROAD - CLEVELAND 12, OHIO

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Grinders! Visual

. . . Work Handling, from page 174

to the cylinder of the pilot valve. The pilot valve, in turn, releases main line air at the proper time (through an air director) to the proper place to accomplish ejection. Such a system is particularly suitable for ejecting parts produced in compound dies. Its adjustability makes it adaptable to a wide variety of applications.

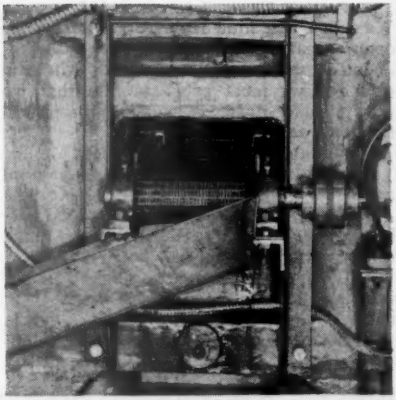
Using Automatic Press Unloaders

There are obviously many cases in which parts unloaded from presses are far too difficult to remove to be amenable for handling by compressed air in the form of a blast. Nevertheless, there are heavy-duty automatic unloaders for presses which require air line connections, for operation together with an electrical circuit properly arranged. These devices have been in use for only a few years, and are often referred to as "Iron Hands." These attachments are equipped with special jaws which engage and unload large stampings from mechanical and hydraulic presses.

This type of device is self-contained and fully automatic. Such stampings are automobile roofs, side panels, hood tops, floor pans, and various other large stampings are handled to advantage. Steel jaws grip and remove the stamping the instant the press ram begins its return cycle. Where use of such a device replaces manpower in removal of large metal stampings, safety is grealty enhanced, and fatigue is greatly reduced. When the press ram descends and completes the forming or shearing operation, as the case may be, the jaws of this device move into the die and take a firm hold on the stamping the moment the press ram rises sufficiently to permit its removal.

It then lifts the stamping out of the die and swings it back. It can be made to place the stamping on a conveyor, (if such an arrangement has been predetermined)

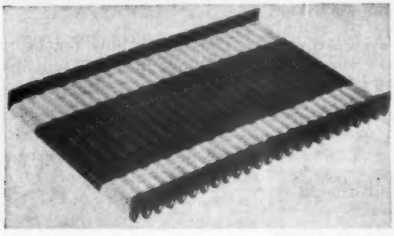
(Continued on page 198)

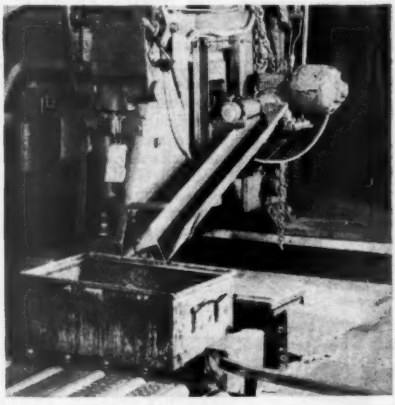


Rear view of silent chain built-in press conveyor. Blanked parts, seen approaching, are automatically dumped into the chute or trough in the foreground, leading down to the left, for handling as shown at bottom of page.

Shown below is a section of a silent chain as arranged and used in silent chain conveyors for press work as described in text. Note how special links are provided along the edges so that stampings carried by conveyor cannot slide off the chain to the slide.

The illustration at the right shows how stamped parts deposited in chute by silent chain conveyor slide down into a tote box. Note tote box mounted on ball transfers to facilitate shunting onto gravity roller conveyor in foreground.





NOW MANUFACTURING FOR THE ARMED FORCES

ONE OR A MILLION
PRECISION BUILT
GEARS
1/8" TO 80" IN DIAMETER
Metallic and Non-Metallic
CUTTING ONLY OR COMPLETE GEARS

SPUR
HELICAL
WORMS
BEVELS
SPLINES
RACKS, SECTORS
SPROCKETS
Since 1910

Expert Machining of Magnesium and Aluminum For Aircraft Industry

Machine Repair Parts • Breakdowns A Specialty • Round The Clock Service • Job, Production Machining and Gearing • Boring Mill Capacity To 80" • Over 400 Machines To Serve You • Ask For Our Equipment List; Catalog on Sprocket Gears and Chains.

UNIVERSAL GEAR WORKS, Inc.
1305 E. McNichols Detroit 3, Michigan

OPTICAL MICROMETER

Toolmaker Microscope

Prompt Delivery. .0001" accuracy. 6½" x 6½" range. Net weight 38½ lbs.
Without lights or gage rods.
Some open territories available.

WRITE AIRMAIL
BOECKELER INSTRUMENT CO.
45 E. Rillito Street • Tuscon, Arizona

"GROUND STEEL"

Stripper Plate, Machine & Tool Steel

— Any Size or Thickness —

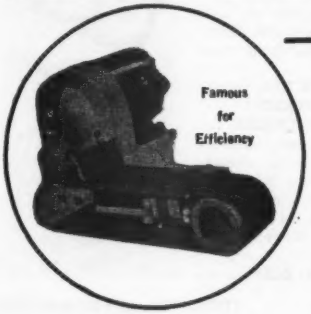
Buy Steel, Ground on Both Sides
Saves You Time—Labor—Money
Ready To Use—Perfectly Flat

— Immediate Delivery —
also "BLANCHARD GRINDING"

SAL METAL PRODUCTS CO.
120 Freeman St., Brooklyn 22, N. Y.
EVergreen 9-2560

For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheet, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

MICHIGAN CHROME & CHEMICAL COMPANY
6340 E. Jefferson Ave. • Detroit 7, Mich.



• *HIGH SPEED GRINDING* •

STANDARD D-4 ABRASIVE BAND GRINDER

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit!

Other styles and sizes in New Manual on finishing — Write today

WALLS SALES CORP.
333 NASSAU AVENUE BROOKLYN 22 NEW YORK

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Use free Inform-A-Gram Card for fast service

QUICK-PIC

JIG & FIXTURE PARTS

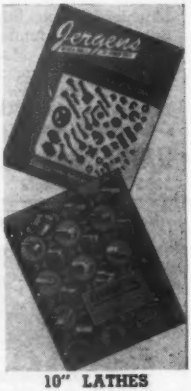
Thirty-one typical Jergens components are pictured and identified in a current brochure. Each is precision made of alloy steel.

Circle No. E1.

CARBIDES

Besides covering their complete line of carbide tools, Kennametal's extensive Catalog 51 gives valuable data on cutting speeds, machining hints, etc.

Circle No. E2.



10" LATHES

Features of speed, accuracy and convenience are detailed in illustrated Bulletin 5135, which covers South Bend 10" Precision Lathes and their accessories.

Circle No. E5.

STAMPINGS

Laminated Shim's new stampings book gives such information as will assist buyers in preparing specifications that will insure lowest possible quotations.

Circle No. E6.

INSPECTION

Rahn offers a new brochure on its basic precision inspection equipment (black granite), including surface and angle plates, parallels and straight edges.

Circle No. E9.

CARBIDE TOOL HOLDERS

Armstrong holders and Armide carbide-tipped cutters are presented in this colorful booklet. Hints on proper care of cutters are given.

Circle No. E10.

MACHINE TOOLS

Comprehensive, 64-page Catalog AB-51 has been brought up to date by Delta with new prices. Drill presses, saws, grinders, etc., are included.

Circle No. E3.

DIE STEELS

"Why Desegatized?" is an interesting Latrobe booklet completely describing the various advantages of Latrobe Desegatized Die Steels and High speed Steels.

Circle No. E4.

PROFILE GRINDER

Sheffield Micro-Form Grinders, subject of a new catalog, are especially suited for the grinding of circular and flat form tools, etc., from carbide.

Circle No. E11.

ROTARY FEED TABLES

A 16-page, three-color bulletin shows installation photos, describes in detail all parts of Bellows Rotary Work Feed Tables.

Circle No. E12.

GRINDING

"Grinding Carbide Tools" is Norton's excellent, 142-page handbook on how to recondition and sharpen carbide tools and cutters rapidly and economically.

Circle No. E7.

BOREAMING

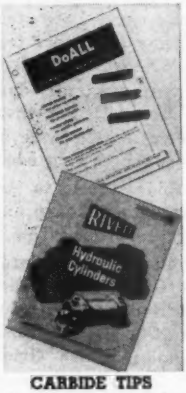
Photographs, current prices and specifications are included in Madison Mfg. Company's book on boring bars, boring tools, "Boreamers," multiple cutters.

Circle No. E8.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

CATALOGS

Use free Inform-A-Gram Card for fast service



CARBIDE TIPS

Tungsten carbide tool tips, dies and wear parts are covered in Adamas' latest catalog. A grade selection guide and tips on how to torch braze are included.

Circle No. E17.

SHEARS

Up-to-the-minute information on shearing is given in brand-new Cincinnati Shear Catalog S-6. There are 32 pages of photos, drawings and descriptions.

Circle No. E18.

CARBIDE TOOLS

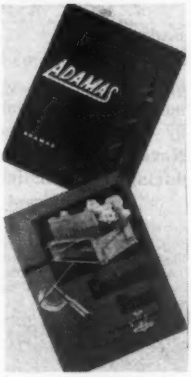
DoALL Standard Carbide Tools are described in Catalog 51-817. In addition to specifications and prices, it contains recommended steps for grinding.

Circle No. E13.

CYLINDERS

Well planned and attractively illustrated, the 12-page, Rivett Hydraulic Cylinder Catalog Section 105 covers cylinders offered in three pressure ranges.

Circle No. E14.



MALLEABLE CASTINGS

The heavier weights of malleable castings are the subject of an attractive Belle City folder. Production procedures are shown.

Circle No. E21.

ABRASIVE CUTTING

A color-coated chart giving recommendations for the selection of abrasive wheels is a feature of Allison's new, comprehensive catalog.

Circle No. E22.

INDICATING

Dependable readings can be made with the new Indi-Ac Electronic Indicator. This instrument is fully described in Graham-Mintel's Bulletin No. 101.

Circle No. E15.

TURRET LATHE

Big capacity is a feature of Potter & Johnston Model 10-U Automatic Turret Lathe. It's powered for carbide tools. Bulletin 146 gives all the facts.

Circle No. E16.

FACING LATHES

Sectionalized T-Lathes, adaptable to many turning and facing jobs, are being imported from Western Germany by Kurt Orban. A brochure is offered.

Circle No. E23.

ROTARY CUTTERS

S & E Bulletin Number 103 illustrates in actual size all the 10 shapes now available as standard tools in their line of tungsten carbide rotary cutters.

Circle No. E24.

MEASURING

New 80-page Catalog GEC-1016 summarizes for the first time under one cover all G-E measuring equipment for laboratory and production line use.

Circle No. E19.

HANDLING

Using a unique system of visual cross reference charts, a condensed Clark Equipment catalog makes all essential truck model data available at a glance.

Circle No. E20.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Carbide Grinding, from page 78

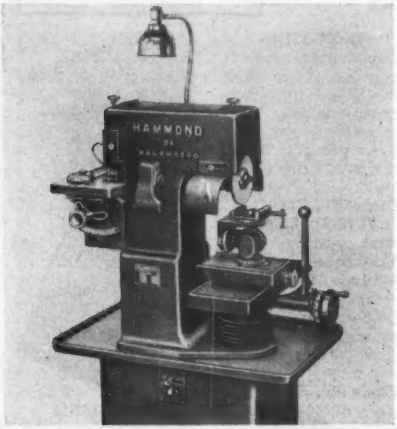


Fig. 5. Hammond Model CB-77 chip breaker and diamond finishing grinder with "Any-Angle Vise" arranged for wick and drip feed on diamond, cup or straight wheels.

the diameter of curl determines the width of the chip breaker; therefore, it must be ground accurately by mechanical methods. It is equally important that it be done on a vibrationless, precision-built machine such as the wet or dry Hammond models shown in Figures 5 and 6.

In grinding, the tool is held positively at the necessary angular setting by an "Any Angle Vise" with the top of the tool horizontal and the diamond wheel rotation from the cutting edge toward the shank. The table is then traversed with a feed not to exceed .0005" per pass until the desired depth is reached.

Noticeable savings in diamond wheel costs are repeatedly reported by the use of wet chip breaker grinding on a machine such as illustrated in Figure 6. The sharpening, as well as chip breaker grinding, of the increasingly popular carbide insert tool is also done on this type of equipment or on surface grinders by substituting an insert grinder, Figure 7, for the "Any Angle Vise." Both ends of the insert may be ground, as well as chip breakers in round, triangular, square or rectangular inserts.

Basic Rules for Grinding Single Point Tools

The following basic rules are the result of years of experience gained by tool engineers, superintendents and other tool men, and may well be reviewed.

1. Keep the tool moving constantly during the grinding operation with the wheel running down into the cutting edge, never crosswise or away from the cutting edge.

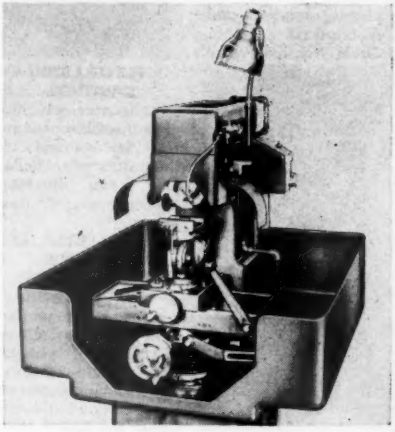
2. Dress silicon carbide wheels to $\frac{1}{16}$" crown frequently to keep them sharp and free cutting and to prevent overheating.

3. Grind in the following procedure: Top Surface; Rough Grind Side Relief Angle; Rough Grind Front Relief Angle; Grind Chip Breaker if needed; Finish Grind Side Relief Angle; Finish Grind Front Relief Angle; and Grind Nose Radius.

4. Grind wet or dry; never a compromize of the two except in the case of diamond wheels, which should be moistened by drip or wick feed to prevent loading. Never quench the carbide tip in coolant during dry grinding.

(Continued on page 184)

Fig. 6. Hammond Model CB-77W wet chip breaker and diamond finishing grinder with "Any-Angle Vise" arranged for diamond grinding with a flood of coolant on cup or straight wheels.



SHALLOW HOLES...DEEP HOLES
DRILL THEM FASTER, ALL BETTER
WITH A *Commander*
DRILL CHIP BREAKER

✓ Small Chips Permit 50%—400% Increase in Drilling Speeds
✓ Drill 10 Diameters or More in Depth Without Clearing Drill
✓ Better, Smoother, More Accurate Holes

Reciprocating action of the Commander Drill Chip Breaker breaks chips into small pieces that travel up drill flutes . . . permitting higher drilling speeds . . . doubles and triples production of shallow OR deep holes. Long chips which cause drill breakage, scored holes, slow jig and fixture loading, are eliminated—small, easy to handle chips flow up out of hole continuously, permitting coolant to reach cutting edge of drill. Assures longer drill life, more holes per sharpening, more holes per hour. Your nearby COMMANDER Distributor has the Drill Chip Breaker and other Commander Production Tools.

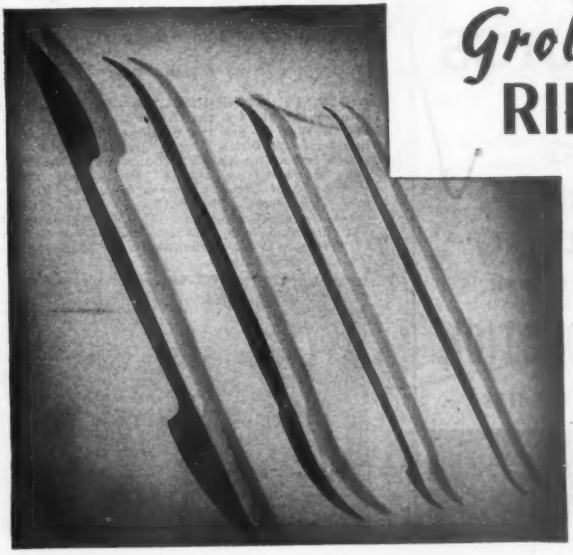
Ordinary Chips

Chip Breaker Chips

Commander MFG. CO.
4228 W. KINZIE STREET • CHICAGO 24, ILLINOIS

Write FOR CATALOG #851
which describes Commander's Production Tools

Files Hand



Grobet
RIFFLERS

GROBET produces more RIFFLERS in more shapes and sizes than any company in the world.

SOLD THROUGH LEADING SUPPLY HOUSES.

Send for Catalog AF-3

GROBET
FILE CO. of AMERICA, Inc.
421 Canal Street
New York 13, N. Y.

Plants: New York
Chicago - Montreal

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Feeds Work + Machine

OLD WAY

REPLACE
Old-Style Hand Feed With
ACRO-BORE!

SKYLINE WAY

CUT BORING COSTS!

Hundreds of installations prove value of ACRO-BORE automatic boring feed in boosting production, saving time and materials. Increase YOUR production on jig boring work ... lengthen tool life ... minimize operator fatigue ... bore with jig borer accuracy ... for only pennies per day! For details, write TODAY to:

SKYLINE TOOL & GAGE CO.
4127 NEWARK AVE., CLEVELAND 9, OHIO

"JOHNS"

DRILL JIGS

FOR

DRILLING
TAPPING
MILLING

LARGE OR SMALL PARTS

UNIFORM
ACCURATE
MAXIMUM PRODUCTION

WRITE FOR DETAILS

Manufactured By
HEUSER MFG. CO.
1638 N. Paulina St. Chicago 22, Ill.

. . . Carbide Grinding, from page 182

5. Avoid undue or excessive dressing of diamond wheels. Use diamond wheels on smooth running, vibrationless equipment having precision bearings and spindles.

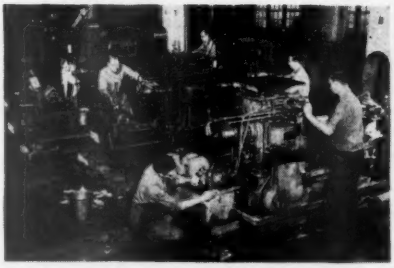
6. Regrind tools before extreme dullness

Fig. 7 shows Hammond Model VC solid carbide insert grinding fixture mounted on the Hammond Model CB-77 chip breaker and diamond finishing grinder.

is reached. The continued use of a dull tool results in more power consumption and danger of tool damage.

★ ★ ★

AIRCRAFT MACHINE TOOLS (below), put into mothballs by the Air Force at the end of World War II, are reconditioned on an assembly line basis at Buick Motor Division, Flint, Mich., which is tooling up for production of the Wright J65 Sapphire jet engine. Buick has received about 500 of these machines from the Air Force pool and needs about 2700 more to equip the three large jet plants it has under construction. The machines are cleaned and dismantled, and all worn parts are replaced before they are ready for production again.



PROSSER CARBIDE TOOL GRINDERS SAVE TIME — SAVE MONEY!

Prosser grinders are outstanding for speed, accuracy, thrift and are available in a wide range. Famous Prosser indexing device permits instant, accurate angle setting that "stays put". Easy adjustment permits virtually 100% use of wheels. For grinding carbide, high speed steel, stellite and other modern tools, with any combination of diamond, silicon carbide or aluminum oxide wheels. Wet or dry models.

Designed by Prosser — originator of cemented carbide for American industry — these efficient grinders are ruggedly constructed to serve you dependably for years.

PROMPT DELIVERY. Send for catalog of floor and bench models, chip breaker, drill-grinding and other attachments.

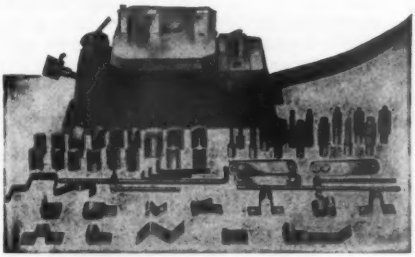
Model AA for dry grinding

Model [illegible] wet or dry grinding

THOMAS PROSSER & SON 118 WALL STREET, NEW YORK 5, N. Y.

THE Multiform BENDER

CUTS, BENDS, PUNCHES - WITHOUT SPECIAL TOOLING



Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend and cut round or flat brass, bronze, aluminum, steel, etc., up to 3/16" x 1½" as illustrated, other models up to ¼" x 4".

Write for descriptive literature.

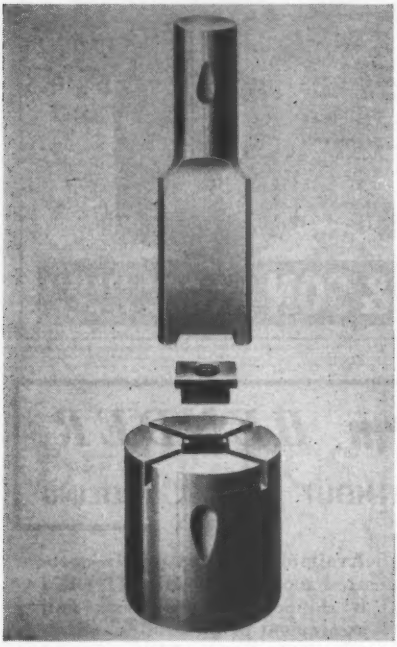
J. A. RICHARDS CO.

NORTH PITCHER ST. KALAMAZOO, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Clinch Nuts Inserted by Conventional Dies

A new tooling technique for the insertion of type H clinch nuts has been developed by Richard Brothers Division, Allied Products Corporation of Detroit. This tooling consists of an interchangeable magnetic punch and clinching die button shown in Figure 1 and becomes a normal piercing station in the die which makes the part. The same die not only will insert clinch nuts, but will also pierce, form or blank, thus making the insertion of clinch nuts an operation simultaneously performed with other production steps.



Photos courtesy Richard Brothers Division of Allied Products Corporation.

Fig. 1. Punch and die tooling for automatic clinch nut insertion. Punch holds nut magnetically. Nut pierces hole and is clinched underneath by die button.

The interchangeable punch and die eliminate extra clinching for clinch nuts and make them substitutes for welded nuts or tapped holes.

Fig. 2. Clinch nuts are fed to the die from a hopper and flexible feed chute, then inserted as part is formed.

The clinch nuts are fed to the piercing station from a hopper and flexible feed chute adjacent to the press as shown in Figure 2. As a nut arrives at the piercing station, it is held magnetically to the bottom of the punch. Since the nut itself does the piercing, one stroke of the press pierces the work and as the slug falls through the die button, lips on the die button clinch the nut to the underside of the work.

In Figure 3 the cut-away shows how the die button actually swages the workpiece as well as the nut. This produces a strong key which eliminates nut rotation regardless of the nut shape.

The only difference between the clinch nut die and a normal piercing die is the grooved spring pad which feeds nuts from the chute to the punch. This construction can be employed on large or small dies alike, in fact, anywhere that a hole would normally be pierced. Panels up to .190" thickness have been pierced with no difficulty.

Standard sized magnetic punches, die buttons, hoppers and flexible chutes for this type of operation have also been developed.

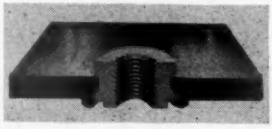
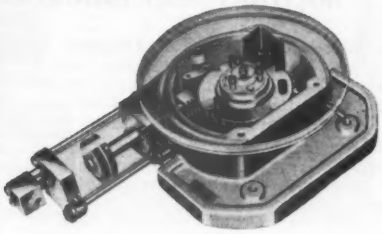


Fig. 3. Cut-away shows how the R-B clinch nut die button actually swages workpiece as well as the nut. A strong key is produced which eliminates nut rotation regardless of the nut shape.



ALLEN AIR OPERATED DIAL FEED TABLES

MODEL 11EA and 11EB

- Working Mechanism Completely Enclosed
- Rack and Gear Drive
- Clockwise or Counterclockwise Rotation
- Adjustable from 4 to 24 Index
- Guaranteed Against "Override"
- All Working Parts Flame Hardened

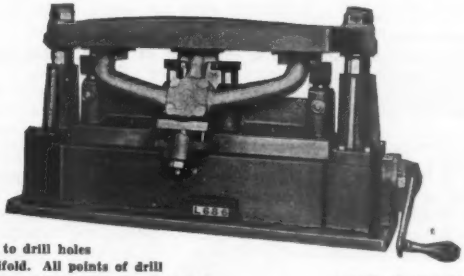
Please Write For Illustrated Brochure

THE A. K. ALLEN CO., INC. AGENTS IN PRINCIPAL CITIES

57 MESEROLE AVENUE • BROOKLYN 22, N. Y.

DESIGNERS • BUILDERS

ALL TYPES OF HOLDING FIXTURES FOR MACHINE SHOP PRODUCTION



Fixture to drill holes 'n manifold. All points of drill thrust are automatically compensated.

CATALOG 941 AVAILABLE

SWARTZ TOOL PRODUCTS CO., INC.

TELEPHONE WE-3-1522

13330 Foley • Detroit, Michigan

Representatives:
SYRACUSE Arthur Irvine
CLEVELAND Production Tool Co.
MILWAUKEE Geo. M. Wolff Co.
HOUSTON-DALLAS Engineering Sales Co.
CHICAGO Ernie Johnson
PITTSBURGH Tool Engineer Products
PHILADELPHIA Morgan Tool Equipment Co.
LOS ANGELES Technical Broaching Co.
NEW ORLEANS Engineering Sales Co.
CINCINNATI R. W. Pratt
BOSTON A. R. Shevlin & Co.
TOLEDO Peerless Tool Service Co.
CANADA Firth Brown Tools, Ltd. (Galt, Ont.)

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

MILITARY AND INDUSTRIAL PRODUCTION NEWS

The Increased Production of Aluminum for the nation's defense and essential civilian needs has been given a green light through action by the Defense Production Administration and the Department of the Interior.

Defense Production Administrator Manly Fleischmann has made public the text of a letter to Secretary of the Interior Oscar L. Chapman concerning the proposed construction of a 72,000 ton aluminum reduction plant at Kalispell, Mont., by a company to be owned by Anaconda Copper Mining Company and the Harvey Machine Company of California.

Mr. Fleischmann's letter requested the Secretary of the Interior to enter into negotiations with the proposed new producers to supply them with power, on a long term basis, from the Hungry Horse Dam project in Montana.

Mallory-Sharon Titanium Corporation is moving its general offices from Indianapolis to Niles, Ohio, effective January 1, 1952, according to an announcement made by James A. Roemer, company president. Mallory-Sharon is a jointly owned company formed by the P. R. Mallory & Co., Inc., of Indianapolis, and Sharon Steel Corporation, Sharon, Pa., in the first part of 1951 for the melting and fabrication of titanium and its alloys.

It was also stated that the titanium melting furnace now located in Indianapolis is being moved to Niles. Three new furnaces to be installed at Niles will bring available titanium melting capacity at Mallory-Sharon to two million pounds in 1952.

Lepel High Frequency Laboratories, Inc., manufacturer of induction heating equipment, has moved into a modern new building in Woodside, Long Island, at 55th St. and 37th Ave. just off Northern Blvd. The new plant is expected to triple Lepel's production of high frequency heating equipment.

"Steel Tubing and Its Place in the Steel Warehouses" was the subject of an address last month before the Texas Chapter of the American Steel Warehouse Association by James S. Anderson, assistant general sales manager of The Babcock & Wilcox Tube Company, Beaver Falls, Pa. Mr. Anderson pointed out the parallel growth of mills and warehouses that produce and sell tubular products, and also how the size and locations of such warehouses have kept pace with the industrial development of the country.

The Small Defense Plants Administration has moved its headquarters to the Old Washington Post Building 1337 E Street, N. W., Washington, D. C.

A Considerable Amount of Critical Copper can be saved in the construction of ships through a simple conservation method developed by the Navy. The savings will be accomplished by increasing the length of planking used on wooden ships, thus reducing the number of fastenings between the timbers.

U. S. Electrical Motors, Inc., Los Angeles, will begin construction early this year on a new plant that is expected to expand factory unit space to 700,000 square feet.

APPOINTMENTS

Norton Behr-Manning Overseas Incorporated has formed a new sales-distributing company in Mexico. Known as Norton Behr-Manning, S.A. de C.V., the new company is located in Mexico City where it will supervise the sales and distribution of Norton Pike Company products throughout Mexico.

B. W. Wild has been named assistant works manager, Columbia Machinery & Engineering Corporation, Hamilton, Ohio. He had been master mechanic of Bendix Aviation Corporation plants at South Bend, Ind., and Hamilton.

Carl Hirschmann Company, Manhasset, N. Y. and Los Angeles, is now exclusive U. S. representative for TECHNICA A.G. Grenchen, Switzerland. A line of milling machines and accessories manufactured by the Swiss firm for precision work on small parts is being imported by Hirschmann.

New President of E. W. Bliss Company is Howard U. Herrick. He succeeds L. C. Edgar, Jr., who has resigned. Mr. Herrick had served as executive vice president of the Canton, Ohio, firm until 1945, when he left the company. He recently rejoined Bliss.

Sherman R. Lyle has been named district manager of Timken Roller-Bearing Company's Steel & Tube Division for northern Pennsylvania and New York State. His headquarters will be in Buffalo.

Johnson Sales Company, Montclair, N. J., is now acting as Middle Atlantic States representative for Northwest Chemical Company, according to H. J. McCracken, president of Northwest.

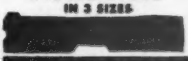
Roger A. Kenman has been appointed sales manager, Machine Tool Division, Besley-Welles Corporation, Beloit, Wisconsin.

SAVE

TIME and MONEY with GARBERDING

STOP-PINS AVAILABLE IN 5 SIZES

FINGER STOPS IN 3 SIZES



STOP-PINS are complete self contained units that hold securely in stripper plate. All sizes have 1/32" wall permitting insertion close to die or punch. No threads inside STOPS for springs to catch on. Write for literature and prices. GARBERDING FINGER STOPS made in uniform width to fit any standard width slots. Just grind ends to fit.

Write for literature.

TWENTIETH CENTURY MANUFACTURING CO.
3720 MONTROSE AVENUE

"Hi-Rockwell" Drills

DRILL, CLEAN, BRIGHT, ACCURATE HOLES IN

HARDENED STEELS

WITH A ROCKWELL HARDNESS OF C34 to C68 OUR FREE BOOKLET TELLS HOW

ALL DRILLS SHIPPED FROM STOCK

We also manufacture the NU-MIKRO piston grooving tool.

CHAMPION TOOL CO.
BOX 463 - FARMINGTON, MICHIGAN

Speedy, easy-to-use!

GRAY-MILLS **Brush Flush** PARTS CLEANING UNIT

FOR... MAINTENANCE, TOOL and DIE WORK —SOME PRODUCTION JOBS

$49.50 Complete with Soak Tank, Basket and Motor. Size, 20" Square

WITH FOUNTAIN BRUSH FEATURE

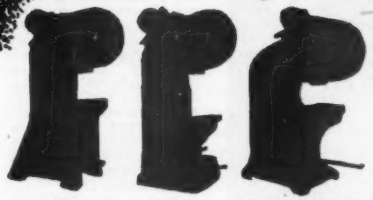
Solvent pumped through handle of long wearing fountain brush . . . flush away dirt and grease as it is loosened by brushing. No splashing or sloshing onto floors and work benches.

Fits conveniently on any work bench. Built to last. See your industrial jobber or write.

WRITE FOR NEW CATALOG TODAY!

GRAYMILLS CORPORATION
3713 LINCOLN AVENUE • CHICAGO 13

KNOCK-OUT HIGH COSTS WITH **ROUSSELLE** PUNCH PRESSES



OBI HORN DEEP THROAT

HIGH SPEED PRODUCTION
LOW ANNUAL MAINTENANCE
for details write
SERVICE MACHINE COMPANY
7627 S. Ashland Avenue • Chicago 20, Illinois

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Helical Inserts Expedite Bolster-Plate Thread Repairs

Helical-wire thread inserts are speeding the repair of worn and stripped bolster-plate threads in the machine shops of Stewart-Warner Corporation of Chicago. Conservative estimates place time savings at more than 80 per cent compared with conventional methods.

In addition to reduction of "down-time" on the 200-odd punch presses in these shops, the wire-insert method of thread repair lowers cost over 60 per cent while providing replacement threads that are stronger and more resistant to wear and corrosion than the original tapped threads. The thread inserts used in this method are precision-formed coils made from stainless-steel wire of diamond-shaped cross-section.

Of the thread-repair techniques in use, the wire-insert method is considered to be most efficient in its consumption of time labor, materials.

The oversize-thread method of repair is considered undesirable because of its space consumption and the need for using larger and more expensive bolts. Since 95 per cent of bolster-plate holes have ⅝-11 tapped threads, repair operations by this method must result in the next larger size, ¾-10. Further repairs would require the ⅞-9 thread size which would be prohibitive because of space requirements.

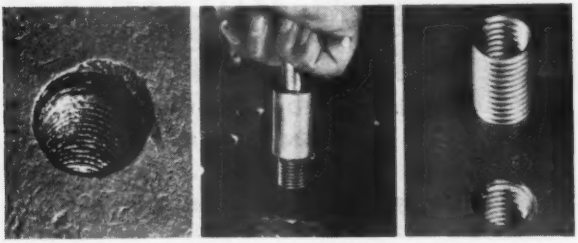
Another technique, the solid-bushing method, is a satisfactory means, except for the excessive "down-time" involved. This method requires more than an hour per repaired thread against the conservative estimate of 10 minutes consumed with a helical-wire thread insert.

Repair operations follow this pattern: After the bolster plate is properly positioned in a drill press, the badly worn ⅝-11 thread, left photograph, is cleaned out with a $\frac{33}{64}$" drill. Retapping is accomplished with a ⅝-11 thread insert tap. Tap sizes are keyed with the original thread size to speed and simplify identification.

After tapping, a ⅝-11 thread insert is installed with an inserting tool, center photograph, and is positioned so that the top coil is one-half turn below the surface of the plate, as shown in the right photograph. Because this is a through hole, the inserting tang—an extension of the lead coil bent inward along a diameter to engage the slot in inserting tool must be broken off after the insert is installed. This is accomplished with a tang break-off tool. On blind holes, the tang is left intact because inserts for this type of hole are specified to lengths prohibiting interference between bolt and tang.

During the two years Stewart-Warner has used the thread-insert method, over 600 inserts have been installed, or an average of three inserts per bolster-plate. Most of these have been for ⅝-11 threads. However, this method has also been used to recondition ¾-10 threads. During this time, no insert has ever stripped, pulled out, or shown any visible deterioration.

Considering the fact that these bolster plates are valued at $100 to $150 each, the prolonged life achieved as a result of each wire-insert thread-repair operation represents an additional economy feature.



Worn and stripped bolster-plate threads, left, are repaired at the Chicago plant of Stewart-Warner Corporation by drilling, tapping and installing helical-wire thread inserts with an inserting tool, center. At right, an un-installed thread insert is shown resting on the surface behind the repaired thread.

Photo courtesy of Heli-Coil Corp.

HIGHEST QUALITY . . . . AT LOWEST PRICE

THE HELIOS

6" and 150 mm Scales .001" and 0.1 mm vernier

$9.50

F.O.B. N.Y.

Accuracy Guaranteed
Hardened Jaws

Send for full details on imported micrometers and calipers

KARL A. NEISE
Importer and Mfgrs. Agent
Dept. T.D. 381 Fourth Ave.
New York 16, N. Y.

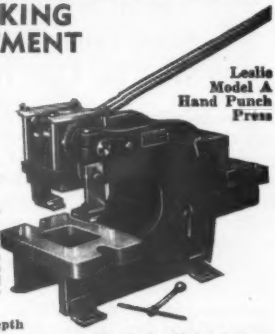
A BLANKING DEPARTMENT

FOR $120.00

SOUNDS FAR FETCHED?

Well, consider these points:

- Capacity Up To 15 Tons
- Patented Leaf Provides Positive Punch and Die Alignment
- 6" Throat Depth
- Large Punch Plate and Bed Facilitate Blanking Over Big Areas



Leslie Model A Hand Punch Press

The Leslie Model A Press is the solution to your short run blanking problems. Write now for illustrated catalog and circular showing punches and dies.

Tool your jobs at low cost from our wide variety of standard punches and dies.

Diagram illustrates versatility of this Press—each blanking done with one stroke.

LESLIE WELDING CO. 2941 CARROLL AVE., CHICAGO 12, ILL.

441 STANDARD SIZES OF MARSHALL STEEL PRECISION GROUND FLAT STOCK

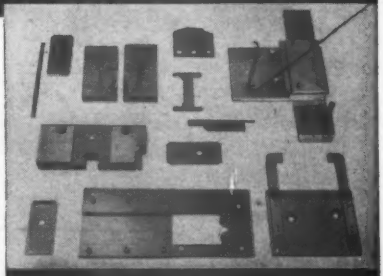
The world's largest range of sizes of precision ground tool steel in three grades are available, ready for immediate shipment and the layout bench.

WATERcrat: A fine grained electric furnace high carbon tool steel. It has been wet ground to remove all bad surfaces and to assure velvet finish of virgin metal.

OILcrat: An outstanding product of careful handling assures you of a fine grained electric furnace oil hardening ground flat stock ready for the layout bench.

AIRcrat: This air-hardening tool steel shows less size change and offers a greater safety in hardening than either of the other grades. Box 108, Dept. TD

Write for descriptive literature, catalog of sizes and prices.



MARSHALL STEEL CO.
LA GRANGE, ILLINOIS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

High Strength, High Temperature Die Steel for Cold Hobbing

Die casting diemakers and users now have available a new die steel that approaches the hobbing ease of regular hobbing irons yet compares favorably with the high strength of the 5% chrome hot work die steels. It is known as "Super Samson" and its mechanical properties and heat treatment are shown in the comparison table, Figure 1. This steel was developed in the laboratories of The Carpenter Steel Co., Reading, Pa., primarily for applications involving die casting of aluminum and zinc. It is also being used successfully in plastic mold work involving large cavities or elevated temperatures.

Super Samson is 50% to 60% as easy to hob as soft hobbing irons and provides an unusual combination of high strength and resistance to heat and abrasion. This unique combination of properties makes it possible for diemakers to apply the proved economies of cold hobbing to more jobs, particularly duplicate dies.

In addition, Carpenter metallurgists claim that the new steel offers this exclusive advantage: It will harden uniformly in dies with wall thicknesses up to at least four inches.

(Continued on page 196)

Mechanical Properties and Heat-Treatment	Super Samson Type Analysis: Carbon .10%, Manganese .50%, Silicon .20%, Chromium 5.00%, Molybdenum .90%, Vanadium .25%		Die Steel Containing 0.40 Per Cent Carbon, 5 Per Cent Chromium, 1.35 Per Cent Molybdenum, 1 Per Cent Vanadium	
	At Room Temperature	At 800 Degrees F.	At Room Temperature	At 800 Degrees F.
Hardness, Brinell (as annealed)	125	—	220	—
Heat-Treatment				
Air-cooled from a temperature of	1750 Degrees F.		1850 Degrees F.	
Draw temperature	800 Degrees F.		1050 Degrees F.	
Tensile strength, pounds per square inch	187,000	183,400	235,000	231,000
Yield point, pounds per square inch	150,000	146,500	208,000	206,000
Elongation in 2 inches, per cent	15.8	19.4	10	11
Reduction of area, per cent	53.4	55.8	38	39.5
Charpy V-notch impact, foot-pounds	32	40	4.5	20.5
Hardness, Brinell	390		450	

Photos courtesy Carpenter Steel Co.

Fig. 1. Chart showing a comparison of the mechanical properties and heat treatment between Super Samson die steel and 5% chromium die steel.

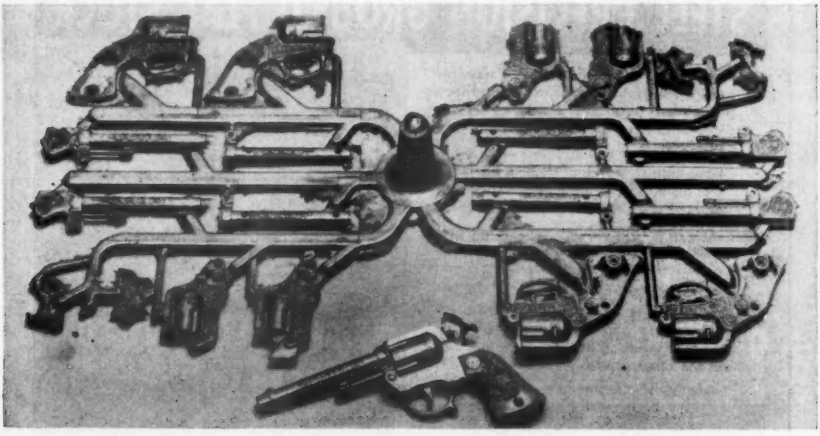


Fig. 2. Zinc-alloy parts for four toy cap pistols are cast in a single shot in the mutiple-cavity die. The ornamental details in the cavity were produced by cold hobbing by Summit-Roberts Tool Co.

Jig & Fixture Parts

REID *One Source for...*

HAND WHEELS — Straight or Dished
CLAMPING HANDLES — Straight or Offset
CAST IRON HAND KNOBS — Standard or Long Shank
THREADED PLASTIC BALLS — Oval or Round

ALSO SCREW CLAMPS, MACHINE VISES, FIXTURE UNITS, MAGNETIC BLOCKS AND ROTARY TABLES. *Write for Catalog and Prices on Complete Reid Line*

REID TOOL SUPPLY CO. 709 Baker Street—Muskegon Heights, Mich.

Fast, Accurate Measurements
With the AMIC "Quick-Action" Vernier Caliper

AT NEW LOW PRICES

The perfect tool for machine shop, tool room inspection and Quality Control. A flick of the thumb and you've got your external and internal dimensions. Knife-edged hardened jaws provide exact thread measurements. A depth gage blade gives speedy measurements. AMIC designed and made exclusively for AMIC by an outstanding European manufacturer.

Scientifically engineered, painstakingly machined, packed in a sturdy leatherette case. A tool without rival.

Size 6" #21B, Graduation 1/40", vernier reading .001.

#22B, Graduation 1/40" and full MM, vernier reading .001 and 1/10 MM.

Write for Circular A. Dealers inquiries invited.

AMERICAN MEASURING INSTRUMENTS CORP.
AMIC BUILDING
21-25 44th Ave., Long Island City, N. Y.
TELEPHONE: EXeter 2-0002

Lassy **WORK HOLDER**

Quick, accurate set-ups on lathes, jig borers, milling machines, grinders and drill presses.

Guaranteed accuracy .0005.

Made of finest cast iron, normalized for accuracy. Round steel insert hardened and ground. Recess in V for objects with heads.

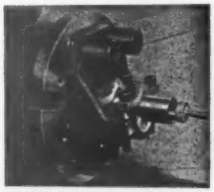
Holes for work stops. Eccentric counterbalance weights for quick, easy balancing.

Capacity 1/8" to 2".

Model R (illustrated) $49.50

Model P with quick acting swing clamps $67.00

F.O.B. Plainville, Conn.



SETUP FOR TURNING OR GRINDING. Two bolts through base fasten work holder firmly to face plate.

LASSY TOOL CO., Plainville, Conn.
MAKERS OF LASSY TAPPERS

HARDENED and GROUND HSS BLANKS

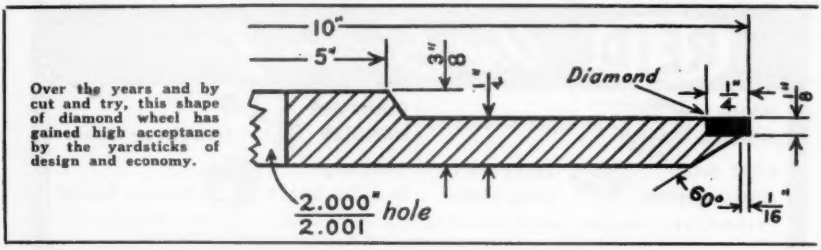
Any decimal diameter to 1/2"—in any length. Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.

Write or Phone ORange 3-4301 for price list D-3

WILLIAM T. HUTCHINSON COMPANY
235 Main St. Orange, N. J.

Steel: Ground

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS



Over the years and by cut and try, this shape of diamond wheel has gained high acceptance by the yardsticks of design and economy.

Correct Wheel Shape Contributes to Diamond Conservation

With the widespread use of cemented carbide face mills and other cutting tools, the demand for diamond wheels for precision grinding and resharpening them has risen to unprecedented proportions. The result was inevitable—backlogs of orders and extended delivery dates. Moreover, the bort variety of industrial diamonds used for their manufacture has acquired the dubious distinction of being one of the critical materials vital to the defense program and as such available only on a restricted quota basis.

This situation points up the pressing need for reminding users of diamond wheels of their proper selection and application in order to get the best life, production and economy from them and thereby help to conserve the supply of bort.

In this connection the selection of the type or shape of diamond wheel best suited to the carbide tools or cutters to be ground is all-important. To cite one example, the Ingersoll cutter grinder employs peripheral type wheels 10" in diameter and from ¼" to ½" in thickness. Over a period of years diamond wheels of several different shapes, with the diamond section molded in the periphery, have been developed for use on this machine. None could be said to be wholly satisfactory from the standpoint of design and economy until the shape represented in the accompanying sketch was brought out.

The ⅛" width of diamond section is adequate for all sizes and styles of carbide-tipped face mills and end mills, and the ¼" depth insures unusually long and economical wheel life. Operators have expressed preference for the design over some of the older shapes because it presents only one half as much core material to be dressed back, whenever necessary. Any sharp carbide tool bit may be used for this offhand dressing operation.

Tool rooms using diamond wheels on their Ingersoll cutter grinder will find it to their advantage to try this new, improved design of diamond wheel. It definitely marks a forward step in the direction of diamond conservation.

The size and shape of the wheel is specified as 10"x⅜"x2", blueprint ME46445. In a resinoid bonded diamond wheel suitable for both rough and finish grinding, a widely used specification is D120-N100B¼. In a separate coarser grit, fast cutting roughing wheel, D100-N100B¼ is recommended, and in a finer grit, strictly finishing wheel, D180-N100B¼ is recommended.

by **E. T. Larson**
Sales Engineer
Norton Company
(from "Grits and Grinds"
Copyright 1951 by Norton Company)

HOWARD U. HERRICK has been appointed president of E. W. Bliss Company, Canton, Ohio, manufacturer of presses and rolling mills. Previously associated with Bliss as executive vice president from 1934 to 1944, Mr. Herrick has held top management positions in the press building industry since 1924. His return to active management of Bliss was requested by the Board of Directors. Since his retirement in 1944 from active participation in the press industry, Mr. Herrick had resided in Florida. The new president succeeds Louis C. Edgar, Jr., who resigned.

LUFKIN chrome-clad micrometers give easier, more accurate readings

The Chrome-Clad finish on Lufkin micrometers is your guarantee of non-glare, easy-to-read markings that are durable. Lufkin precision tools possess many exclusive features that insure the finest measuring tools money can buy . . .

BUY LUFKIN FROM YOUR DISTRIBUTOR

151-C

THE LUFKIN RULE CO. • SAGINAW, MICHIGAN
132-138 Lafayette St., New York City • Barrie, Ont.

Boyar-Schultz COPPER HEAD LAPS

. . . . are accurate, fast working and easy to use. They are much less costly than making laps in your own tool room. Because the only wearing part is the inexpensive copper sleeve they are long lasting.

Unlike laps made for specific jobs, they are used over and over again, changing only the sleeves. Adjustment permits correct lapping size to be maintained till sleeve is worn out and replaced with a new one. Thus, with Boyar-Schultz Copper Head Laps you save tool room time and get accurate, speedy lapping.

Copper Head Laps and Sleeves are immediately available from stock, in standard sizes—⅛" to 2½" diameters.

SPECIAL TOOL MAKERS BENCH LAP SET

Consists of seven most commonly used sizes—⅛"-3/16"-¼"-5/16"-⅜" 7/16"-½", with enameled die cast base.

BOYAR-SCHULTZ CORPORATION
2112 Walnut Street, Chicago 12, Ill.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . High Strength, from page 192

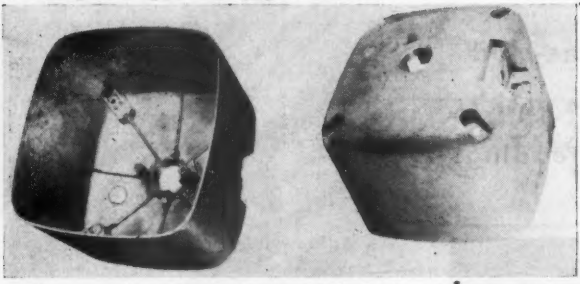


Fig. 3. One of the largest cavities made in a hobbed cavity. The cavity is about 8 inches square by 5 inches deep. Midland Die and Engraving Co. hobbed the cavity for Doehler-Jarvis Corporation.

An example of the intricate details that can be hobbed in Super Samson is found in Figure 2, showing a single-shot zinc casting for a popular brand of toy cap pistols. Part of the cavity for producing this casting was machined, but the ornamental details were cold-hobbed.

Another example is found in Figure 3, showing one of the largest castings ever produced in a hobbed cavity. The original forged blank measured 16x16x10 inches, and the finished cavity is approximately 8 inches square by 5 inches deep. About fourteen pushes were required to reach the necessary depth plus two inches for closing. Bottom relief was used during hobbing, and the die was annealed after each push.

Company metallurgists feel that, based on the present knowledge of this alloy, it is possible to predict that it will provide new opportunities for die economies on many jobs. The greatest savings will probably be found in hobbing versus machining of large or intricate cavities. It is also believed that the use of hobbed cavities will be extended, and this new alloy will permit the casting of designs that are not now practical to make in machined cavities.

YOUR
"SPECIAL BUSHINGS"
May Be Our Regular
STOCK ITEMS!

Ready for Immediate Delivery
TWO complete bushing standards, the A.S.A. Standard plus our own Acme Standard, enables you to obtain bushings from stock that might otherwise require special manufacture. Results in faster delivery, lower cost. Write for catalog.

Accurate Interchangeable Concentric

Acme Industrial Company
Makers of Hardened and Ground Precision Parts
206 N. Laflin Street — Chicago 7, Illinois

THE SERVICE SHOP TO INDUSTRY FOR MORE THAN 25 YEARS

Drill Jig Bushings

DOLLARS from DUST from DIAMONDS!

$ $ $ $ $ $ $ $ $ $ $ $

Diamonds in wheels never wear out; "they just fade away" but the diamonds can be reclaimed and salvaged with a DUSTKOP.

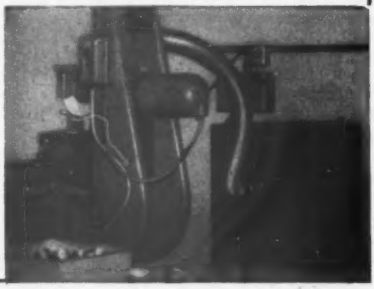
STOP DUSTS—RECLAIM DUSTS

INSTANTLY *with* **DUSTKOP**

This (Model 420 DUSTKOP illustrated) dust collector is only one of the many DUSTKOPS recommended and used for all kinds of dust control including diamond dust salvage. Available from stock of 22 standard models.

300 cfm to 10,000 cfm

Ask for Catalog 605-2. Describe dust problem for recommendation by return mail—
No Obligation



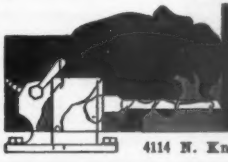
AGET-DETROIT CO.
213 Main St. Ann Arbor, Michigan

DOUBLE YOUR DRILL PRESS OUTPUT FOR $33

Use a New Mead Pneumatic Drill Press Feed for Drilling, Redming, Tapping

This simple, inexpensive device quickly converts standard drill presses into semi-automatic machines — increases production substantially on suitable jobs: double or more in some cases.

Clamps to spindle quill in a few seconds. Automatically closes air fixture on work. Adjustable feed control and breakthrough cushion. Quick return. Easy to synchronize with automatic cycle equipment.



Air-Power does it quicker, cleaner, better. Write today for latest complete catalog.

MEAD
SPECIALTIES COMPANY
4114 N. Knox Ave., Dept. H-22-A, Chicago 41, Ill.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Work Handling, from page 178

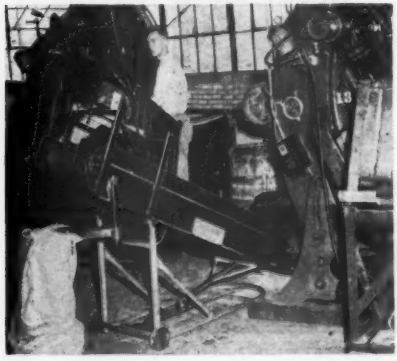
or will place it on a table, either side up. The device then returns to its normal position, awaiting the next cycle of the press. These devices have enabled manufacturers of large stampings to realize full production possibilities of the latest high speed draw presses available. Some of these presses draw panels of different types at a rate of 12 per minute, as compared to little more than half that speed with conventional presses. Operating at these higher speeds, automatic unloading is definitely necessary.

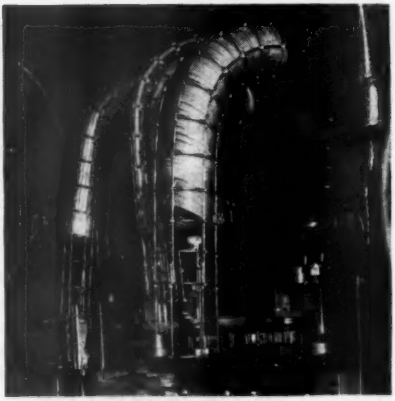
Press Conveyor Applications

Conveyors have their applications in reference to handling at the press. An interesting fact is that silent chain (ordinarily used for power-transmission purposes) has in some instances been employed as a conveyor for use in connection with a press. In one instance, a punch press engaged in making stampings had formerly been fitted with a rubber belt conveyor to receive, convey, and discharge stampings from the press into a tote box or other container. Sharp edges on the stampings continually cut the rubber belt. Stampings also slipped off the side of the belt at times, and got underneath.

In seeking a solution of these difficulties, it was decided to use a silent chain 7½ inches wide, and to fit both edges of the chain with overlapping links, which stood up from the surface of the chain far enough that stampings could not readily slip off. This conveyor of which this silent chain is a part is powered by its own motor, the setup being one of the worm gear reducer type, with power reaching the press conveyor proper through a flexible coupling. The conveyor carries the stampings and delivers them into a downwardly inclined trough, through which they slide into a tote box.

This shows one of the special portable conveyors for use at presses. This conveyor is provided with facilities for holding a bag erect and open to receive parts direct from the conveyor belt.





Special stacking chutes positioned so as to receive blanks directly as punched through the die. These chutes match the blanks uniformly, burr against burr, and insure neat, orderly stacks for removal to subsequent work stations.

It is interesting to note that some leading manufacturers of materials handling equipment have designed and built special cleated belt conveyors of portable type which may be readily wheeled into position at any press. These are placed in such manner that stampings fall from the press onto the upwardly-moving belt of the conveyor. This conveyor then elevates the parts high enough to gravity-load them directly into sacks, barrels, or other containers in which the materials are shipped or stored. Handling small stampings in this manner greatly cuts labor costs.

Conveyors and Hoppers in Batteries

Carrying this general idea further, highly interesting operations have been observed in which a row or battery of standard punch presses make a more or less complicated part by means of pro-

(Continued on page 202)

UNIVERSAL DRILL BUSHINGS establish new standards of high quality

Universal Drill Bushings, produced at the big, modern plant of the Universal Engineering Company, have been first in industry for more than 25 years. They are accurately machined with superhoned bores from the finest quality steel. They are carefully inspected to insure maximum efficiency and extremely long life. Write today for complete information.

The modern home of finer production tools

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 8, MICHIGAN 156-B

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

3AT, 3C
1A, 4C
5C
480
(AC-50)
All collets in hexagon, square and round.
KLUTCH-KOLLET
Step collet for accurate chucking to 2¼" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND CRAFTSMAN • SHELDON LATHES, ETC.

LEVER-TYPE DRAWBAR ½" cap.
Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.

Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!

KASSON Precision

KASSON Precision products are guaranteed unconditionally for accuracy, fit and long life. Your dealer should have them . . . Write us for literature!

GENERAL DIE AND STAMPING CO.
Integrity Since 1919
264 MOTT STREET • NEW YORK 12, N. Y.

Drill Jig Bushings

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Cutting Graduations with Speed and Accuracy

Graduations can be quickly and accurately cut on handwheels, dials, knobs and similar parts such as are commonly used on machinery and other equipment, by a circular graduating machine, shown in Figure 1.

This machine is capable of a wide range in the number of possible graduations—including all commonly used English graduations, Metric graduations and "Degree" graduations. The type of graduation produced can likewise be readily changed to conform with the requirements of any of these systems.

The actual cutting of the graduations is performed by a single-point tool (shown in cutting position in Figure 2) that produces a clear, sharp line of almost any

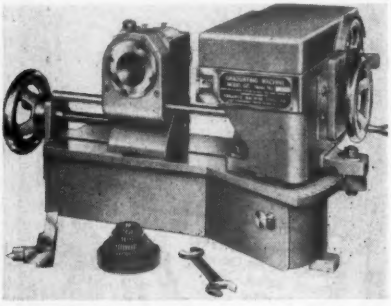


Fig 1. The circular graduating machine for cutting graduations on dials, knobs, handwheels and other parts. The cutting tool, change gears and wrench are in the foreground.

desired length to $\frac{3}{16}$" or combination of lengths. Spacing of the graduations is controlled by a set of change gears and through a worm and worm wheel, assuring "dividing head" accuracy. Graduations parallel with the axis of the work and angular graduations up to 45° can be cut.

The unit is power driven which results in uniform, rapid production. Tests have shown that 55 handwheels, with 100 graduations on each, can be graduated in one hour. An automatic cut-out stops the machine at the end of each cycle so that after the setup is completed it is merely necessary for the operator to take off one piece and put on the next. To change the

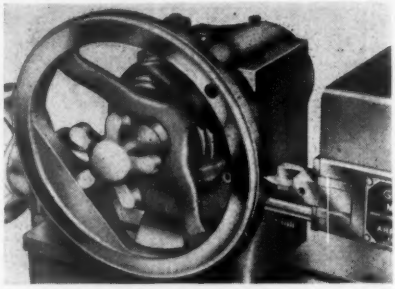
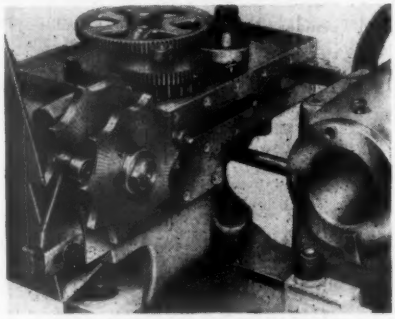


Fig. 2. This 10" diameter cast iron handwheel was graduated at the rate of 35 handwheels per hour, including the time required for handling the pieces by the operator.

setup from one size and type of work to another (Figure 3) is but a matter of minutes. It is only necessary to put on the proper change gears, the proper graduating cams and work holder, then set the depth of cut and proceed.

The smallest diameter that can be graduated with this machine and standard equipment is 1½"; the largest, 20". Cutting speed of the machine is 145 to 1850 graduations per minute, according to the indexing cam used.

Standard equipment consists of motor and switch, nine change gears, two cams, two graduation cutting tools, extended tool holder slide, and wrench.

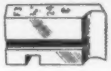


Photos courtesy Abrasive Machine Tool Co.

Fig. 3. This rear view of the machine shows accessibility of cams and gears. In order to change type or size of graduations, it is only necessary to change the cams and gears shown.

ONE SOURCE—

Assures uniformity and precision between taps and chasers from country's largest independent manufacturer of die heads, chasers (milled, ground thread or tapped form), collapsible and solid taps. All tangent type chaser threads ground from solid. Write for catalog.



PROMPT DELIVERY

Save 10-20% on special solid taps

CHASO-ROYCO TOOL CO. INC.

P. O. Box 268 at Akers
North Branch, Michigan

Representatives in principal cities

"RFC" ROLL-FEEDS

Precision Feeds For All Presses

- Easily installed on any press
- Can't slip. Reverse instantly
- Feed in thousandths
- Maintain original setting. No ratchets or pawls to wear down and affect feed spacing.

Write for descriptive literature TODAY.

ROLL-FEEDS CORPORATION
Pawtucket, Rhode Island
An Electric Affiliate

Tomco

HAND WHEELS
HAND KNOBS
MACHINE HANDLES
HANDLES
BALL HANDLES
SPECIALTIES

Write for literature

Tomco PRODUCTS CO.

1425 DOUGLAS AVE.
RACINE • WISCONSIN

Blank or Machined - from stock

CMD LUBRICANTS

***PAY OFF* in higher production**

...Because they have better anti-scoring qualities to work under extreme pressures.

Use CMD on your lathe centers, die set leader pins, steady rests, machine ways, cams, broaches, thrust bearings, taps and dies to name a few. In fact, CMD lubricants work every day under pressures of 40,000 to 50,000 pounds per square inch in thousands of plants from coast to coast.

CHICAGO MANUFACTURING & DISTRIBUTING CO.
1902 West 46th Street • Chicago 9, Illinois

Attach this coupon to your letterhead for FREE SAMPLE KIT Number 21

Your Name_____

Firm Name_____

Address_____

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

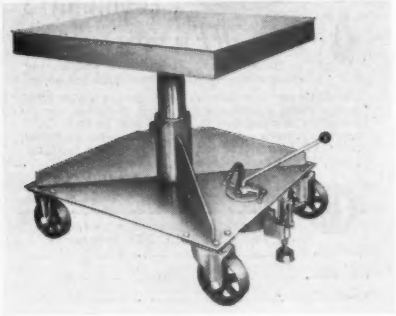
. . . Work Handling, from page 198

gressive operations. As each operation is completed on one press, the part falls out the back of the press onto an inclined belt conveyor of the general type cited. This belt conveyor elevates the part and discharges it into a portable storage hopper, having a front discharge. From this hopper, the work pieces flow by gravity to the next press, for the next operation. Such a cycle can be repeated as many times as necessary to finish any given part.

Where special punchings are being produced which have center holes, and which are used for laminated assemblies, it is interesting to observe that special conveyors are employed to receive the parts from the press, to convey them upwardly on a moving belt, and to drop them down onto so-called matchers. The top end of the matcher (which is set in such relation to the conveyor as to automatically engage the central hole in the work pieces) consists of a bullet-like nose. This nose revolves continually. As the punchings slide from the conveyor onto the nose, they are rotated until the key slots on their inside diameter meet a key on the matcher. The punchings then drop down over a stacking tube onto circular pallets, in properly-matched position.

The stacking tube mentioned is given an oscillating motion, to prevent the stack from binding the tube, and also to aid in holding more uniform alignment. When punchings have been stacked to required height, a lever is pulled which disengages the rotating and oscillating mechanism, and allows the stacking tube to be lifted up out of its seat quite easily. The stack is then transported to the next operation; that of assembling into an armature core.

This Revolvator table is specially designed for handling dies into and out of presses. Table lift is by a hydraulic ram, hand-lever operated. The floor anchor prevents table movement when die is being handled.

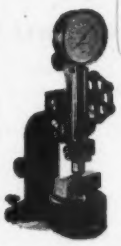


A high-lift platform truck is particularly well adapted for handling dies in and out of presses. The truck is also convenient for transporting work to and from presses.

Stacking Chutes Also Employed

In some cases, it is possible to use a stacking chute, as it is called, instead of a stacking tube. Where stacking chutes are employed, each stacker is built to suit the individual product being made. Using such chutes, it is no longer necessary to let punchings drop into tote pans, and sort them out afterward for additional operations. Stacking chutes such as those mentioned keep punched blanks in neat and orderly stacks, convenient for removal to other work stations.

Only an offhand reference has been made to use of special trucks and tables designed for handling press dies into and out of storage, or into and out of presses as need appears. There are many such devices. We content ourselves, in closing, with bare mention of two. One of these is a special die-handling table, which is lifted by a hydraulic ram, hand-lever actuated. Another is a high-lift platform truck, with the platform overhanging the wheel base sufficiently so that it can be moved directly against the press bed, as well as in perfect line with it. By the same token, it can be perfectly lined up and brought into contact with edges of the shelves in die storage racks.



HARDNESS TESTING

has been done with the SCLEROSCOPE *since 1907*

•

THE SHORE INSTRUMENT & MFG. CO., INC.

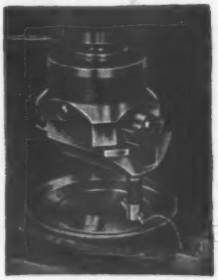
9025 Van Wyck Avenue
Jamaica 2, N. Y.

Want the best?

Specify **ACE DRILL BUSHINGS**

- 3/4 MILLION BUSHINGS IN STOCK is your assurance of prompt service
- WEST COAST AERO TOOL'S REPUTATION is your guarantee of highest quality
- HIGHEST QUALITY TOOL AND ALLOY STEELS provides extreme durability and longer life
- PRECISION MADE — LIGHT-WAVE TESTED for .0003 maximum tolerance

ACE DRILL BUSHING CO.



ONE Tool

ONE Set Up

...for boring, facing, turning recessing, undercutting

Another NEW "MASTER TOOL"

THE UNIVERSAL "MASTERHEAD"

Featuring: automatic feeds, end release and return; adjustable stop; adaptable to all standard machines; highest precision; ideal for jig borers; seven models for work up to 24" diameter.

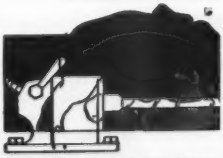
Send for Illustrated Literature

KARL A. NEISE

381-4th Ave., Dept. TP, N. Y. 16, N. Y.

NEW MEAD INDUSTRIAL

AIR POWER CATALOG Ready!



Full of Suggestions

For FASTER, CHEAPER PRODUCTION

Illustrates, describes Air Cylinders, Valves, Air operated Presses, Vises, Chucks, Hammers, Drill Press Feeds, Work Feeders, Timers, semi-automatic combinations, etc.

Write for Complete Catalog! **Pneumatic Cylinders*

MEAD SPECIALTIES CO. 4114 No. Knox Ave., Dept. HA-20, Chicago 41, Ill.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

1952 Forecast:

National Tool and Die Manufacturers Association

Defense orders for tools and dies will practically crowd out civilian tooling during 1952, according to a forecast made by executives of the National Tool and Die Manufacturers Association, Cleveland. NTDMA represents over 500 contract shops which produced over $400-million worth of tooling in 1951. Without the tools, dies, jigs, and fixtures made by this industry, machine tools, presses, and other metal-working equipment cannot be used for mass production.

Complex dies for jet engine blades, aircraft fixtures, and tooling for electronic gun control devices will offer the contract tool and die shops many special problems this year. Backlog in the industry, according to Randolph H. Cope, president of NTDMA and vice president of The Bunell Machine & Tool Co., Cleveland, will reach an alltime high in 1952. Cope predicts that the peak of tooling orders will not be reached before mid-1952.

Many shops are now turning away much of the work offered them because they are already booked to capacity for months ahead.

Growing recognition of how vital the special tool and die industry is to the defense program has led NPA to give appropriate aid through priorities on materials to help production, and DPA on tax amortization to encourage expansion. If OPS includes in the tailored regulation presently being prepared for this industry adequate pricing incentives—and if the machine tools needed by these contract shops are made available through NPA—the outlook for meeting tooling demands in 1952 will be much brighter than earlier seemed possible.

The industry, however, is in a tight labor squeeze that tends to prevent expansion. In this connection Cope points out: "While the steps already taken by government agencies — and others it is hoped will follow — are valuable aids toward getting the greater production required, the final test will be the success of the shops in retaining and expanding their work forces. The tool shops must be allowed to meet competitive offers to their skilled mechanics, of whom there is a great shortage. Training must be encouraged. And insofar as possible the intricate and precise work of tool building must be divided up among machine specialists who can be developed in a fraction of the time required to train tool and die makers. There is a limit of course beyond which the breakdown of tooling production cannot go.

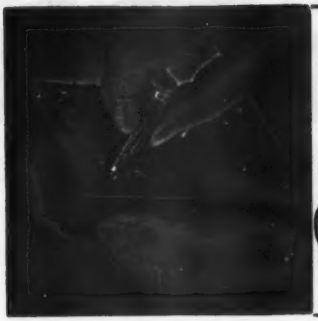
"The inadequacy of the tool and die maker supply makes it very important that these men have efficient equipment with which to work, which points up the request of the Industry Advisory Committee that NPA set up a more effective means of providing machine tools for the contract tool and die shops."

Almost all of the tool and die plants are now pushing their skilled labor to the limit by working overtime, with some shops going 50 to 60 hours a week. Longer schedules cannot be attempted because of shortages in labor and expert supervision.

Looking into 1952, most shop owners, like Centre W. Holmberg, past president of the National Tool and Die Manufacturers Association and president of August W. Holmberg & Co., N. Y., see a good year ahead. A recent survey of a large sample of NTDMA member shops showed about 40% of the shop owners predicting excellent business, 55% good prospects.

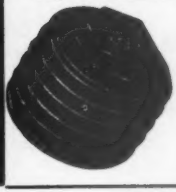
Most shop owners expect that civilian business, postponed because of the national emergency, will take up the business slack when defense business eases off. But, they add, that time in many months off, if present tooling orders for defense items are any criterion.

ACCURATE BUSHING CO., Garwood, N. J. manufacturer of drill jig bushings, has opened a Chicago office at 5722 W. Chicago Ave. Stocks will be carried in connecting warehouses and these new quarters will be in the charge of a factory branch engineer. The new office will also service Milwaukee, Minneapolis, St. Paul, Indianapolis, Davenport, St. Louis and territories adjacent to these cities.



A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in $\frac{1}{16}$" to 1" diameters.

Send for price list.

HEIMANN MFG. CO.
Dept. T Urbana, Ohio

Announcing
COLONIAL #3

A More Wear-Resistant Drill-Jig-Bushing Steel

•

Fully Field-Tested

•

To reduce your bushing costs, specify bushings made from "Colonial #3".

All standard COLONIAL drill jig bushings are now made from Colonial #3—a new oil-hardening steel having many times the wear-resistance of former bushing steels. Also gives greater uniformity.

COLONIAL BUSHINGS INC.
P.O. BOX 37 HARPER STATION
DETROIT 13, MICHIGAN

MORE FOR YOUR SCRAP

DURANT SCRAP CHOPPER

LOW FIRST Cost
PAY FOR ITSELF

Electric plug installation
Economical operation
Fits Any Power press

Write for free catalog sheet

DURANT TOOL SUPPLY CO.
155 ORANGE ST., PROVIDENCE 3, R. I.

MILWAUKEE DIE FILERS PROFILE GRINDERS

Gives you more value for your money!

DIE FILER

Model F5 shown performs all die making operations. Equipment includes File Roller Support Overarm in addition to overarm shown.

PROFILE GRINDER

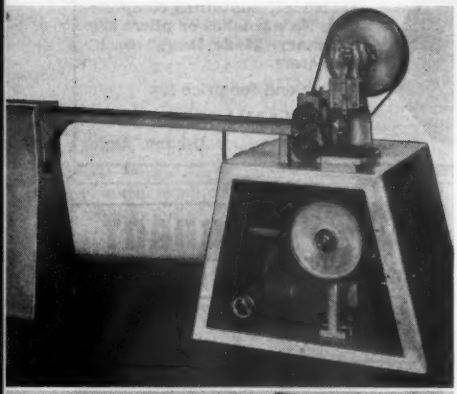
Available in two models, STANDARD and HIGH SPEED. Features ½ HP Motor for non-stalling power, Collet Chuck for extreme accuracy and compound tilting table.

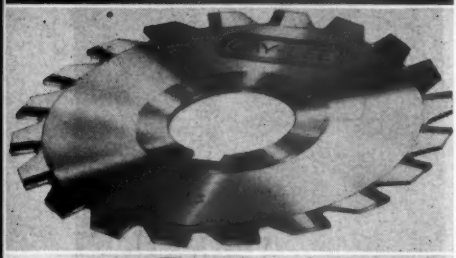
RICE PUMP & MACHINE COMPANY
228 N. MILWAUKEE ST., GRAFTON, WISCONSIN

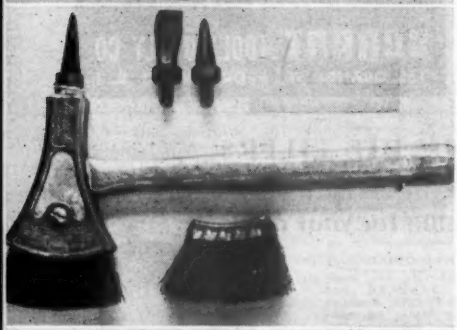
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

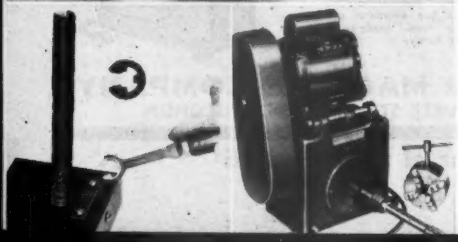
PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS









A Combination Marking and Cut-Off Machine for tags, plates, etc., consists basically of two Emco presses. A feeder conveyor provides a means of approach for the material that is to be marked and subsequently cut off. A roll-feed attachment holds the section to be stamped or marked while one press performs the operation. A second press cuts off the piece after it is marked. Write THE KLAAS MACHINE & MFG. CO., 4312 E. 49th St., Cleveland 25, Ohio, for more details.

Circle Inform-A-Gram No. A1.

A Carbide-Tipped "THINSAW" for extreme precision slitting is offered by Gay-Lee Co. It is available in thicknesses down to .030", with tolerance held to .0002" and in diameters up to 5". Ample chip clearance is provided in the new saw, notwithstanding the extreme thinness. These saws produce deep cuts without run-out and can be built flat with no protruding hub so that they may be lined up side by side for close multiple cutting. GAY-LEE CO., 71 W. 14-Mile Rd., Clawson, Mich.

Circle Inform-A-Gram No. A2.

The "Re-Fil-It" Welding Brush Slag Cleaner Tool is a new type of two-in-one brush and chipping hammer combination. It is used in removing slag from a weld and will do a more thorough job in less time and with less effort than the conventional wire scratch brush. The handle of the brush is balanced properly and the shock of the hammer blows is cushioned in the solid aluminum handle. THE HOWELL DEVICE CO., 8811-T Maywood Ave., Cleveland 2, Ohio.

Circle Inform-A-Gram No. A3.

Stacked Open-Type Retaining Rings (outside cut) sharply reduce normal assembling time and feature one-at-a-time dispensing and application. Loss of rings through handling is completely eliminated. A specially designed base holds the ring stack erect. The retaining rings then, are readily dispensed and applied with one hand and with one continuous motion. INDUSTRIAL RETAINING RING CO., 8 W. Sidney Ave., Mt. Vernon, N. Y.

Circle Inform-A-Gram No. A4.

A Three-Speed Power Reamer (inside cut), portable Model R, has been added to the Joseph E. Murphy Co. line. It can be used for reaming and chamfering and can be equipped with a tapping head for use as a high speed, horizontal tapping unit. Also, it can be used as a production lapping and honing unit. The output speeds are 95, 120 and 165 rpm. Capacity is up to 1 3/16" reamer. Bulletin 549 gives complete details. JOSEPH E. MURPHY CO., 24 Ellsworth St., Worcester 3, Mass.

Circle Inform-A-Gram No. A5.

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

The New Gairing Series 6500 E-CON-O-MILL has all of the economy features of the original, plus a greater number of blades. This cone-type face mill is made in diameters of 8", 10", 12" and 14". Blades of ½ to ⅝ tool bit type are tapered two ways, and tungsten carbide tipped. These blades are available in three types: to cut steel, cast iron and non-ferrous materials, each type with the proper carbide. THE GAIRING TOOL CO., Box 478, Detroit 32, Mich., will provide literature.

Circle Inform-A-Gram No. A6.

A Nylon Holder for felt polishing wheels is now available. Molded of durable nylon around a ⅛" dia. steel mandrel insert, the new holder solves the mold polisher's "nemesis" by eliminating all danger of damaging the work surface with the conventional "center-screw" type of felt holder. Side and bottom grips prevent slippage and vibration. Write to DETROIT MOLD ENGINEERING CO., 6686 E. McNichols Rd., Detroit 12, Mich.

Circle Inform-A-Gram No. A7.

The Liquamatte Wet Blast Machine features a vertical pump for slurry recirculation. It is adaptable to rugged service and eliminates all suction piping, valves, fittings and labor for removing them for inspection of the pump. The machine is intended to perform work for which dry blasting is too severe. The manufacturer, AMERICAN WHEELABRATOR & EQUIPMENT CORP., 555 S. Byrkit St., Mishawaka, Ind., will send Bulletin 23.

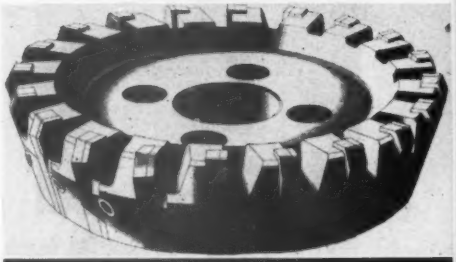
Circle Inform-A-Gram No. A8.

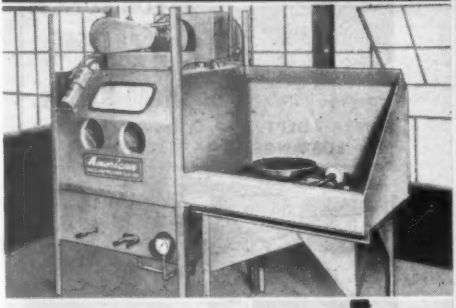
SAJO Horizontal Milling Machines (inside cut), made in Sweden, are now being distributed in the U.S. and Canada by Austin Industrial Corp. They are of the medium duty, high speed type, available in both plain and universal models. Illustrated is the plain miller with power longitudinal, transverse and vertical feeds. Power is transmitted to the spindle from a 3 hp motor mounted in the base of the column. Twelve spindle speeds from 36 to 1540 rpm are available. AUSTIN INDUSTRIAL CORP., 50 Church St., New York 7, N. Y.

Circle Inform-A-Gram No. A9.

New Twist Drill Grinder (outside cut). Two- and three-lip carbide and other twist drills from .078" to 1" dia., can be ground consecutively in the new Cawi-Spiral machine to a high degree of accuracy, according to Kurt Orban Co., Inc., who is importing the machine from Western Germany. Key to the accuracy is a patented planetary drive gear system. Write for bulletin to KURT ORBAN CO., INC., 21 West St., New York 6, N. Y.

Circle Inform-A-Gram No. A10.

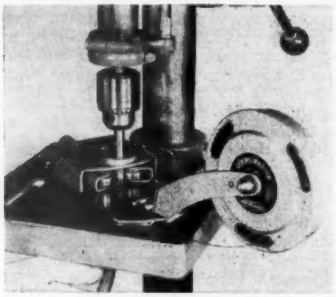




The Micro-Ac Electronic Microcomparator is read directly in millionths of an inch and is designed specifically for gage room use and

for ultra-precision production gaging. It consists of an induction-type gage head adjustably mounted on a rigid stand, and a high-stability, 4-tube amplifier with a 2-scale meter. The gage head has a frictionless movement, with no mechanical amplification; the amplifier is free of drift; and readings are not affected by any ordinary fluctuations in line voltage or by near-by magnetic fields. Consistent repeat readings can be obtained. GRAHAM-MINTEL INSTRUMENT CO., 735 Carnegie Ave., Cleveland 15, Ohio, will send an illustrated bulletin covering this new instrument.
Circle Inform-A-Gram No. A11.

The Spring-Master Spring Making Attachment makes it possible to wind springs on a standard drill press instead of resorting to cumbersome and time-consuming lathe setups. It is applied to any drill press with ½" chuck or larger, and springs in a wide range of wire sizes and diameters can be made at high speed. An unlimited variety of extension and compression springs can be produced on the



Spring-Master. Further details can be had by writing to THE DoALL CO., Dept. T&P, 254 N. Laurel Ave., Des Plaines, Ill., or by calling at any DoALL Sales-Service Store.
Circle Inform-A-Gram No. A12.

ENCLOSURE SAFGUARD FOR PUNCH PRESSES

Strand Mfg. Co.
DEPT. B, P. O. BOX 762
LOS ANGELES 44, CALIFORNIA

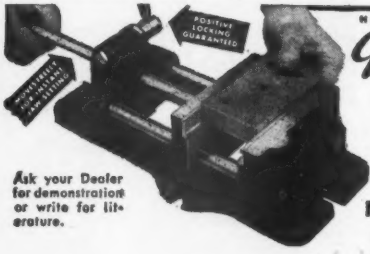
CONVERT YOUR ENGINE LATHES to TURRET LATHES

5-Tool Tail Stock Turret

Four sizes up to 24" swing

TODAY Send for Folder

JEFFERSON MCH. TOOL CO. 672 W. 4th Cincinnati 3, O.



Ask your Dealer for demonstration or write for literature.

HEINRICH Grip-Master

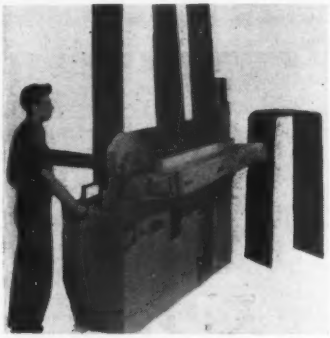
GRIPS WITH SPEED CUTS TOOLING COSTS

Step up drill press production with the Heinrich "Grip-Master" Screwless Vise—with the patented "Circle Grip" hammer blows cannot break. Work is automatically leveled; jaws set instantly, effortlessly. 3", 4", 6", 8" jaw widths; ideal as base structure for drill jigs and fixtures.

NATIONAL MACHINE TOOL CO.
DEPT. 132-B RACINE, WISCONSIN

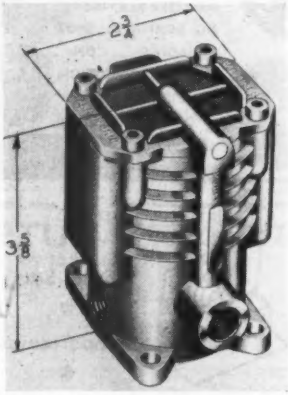
PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Model "F" Single-Wing Tangent Bender is announced by Cyril Bath Co. It has been engineered to shape flanged sheets around fixed radi-



used corners without wrinkling. The Bath tangent bender features automatic positioning of the metal to be formed and close control throughout the entire process. A detailed engineering catalog can be had from THE CYRIL BATH CO., 7037 Machinery Ave., Cleveland 3, Ohio.
Circle Inform-A-Gram No. A13.

A New Pilot Valve is offered by Valvair in 2-way and 3-way models, 110, 220 and 440 volts, 60 cycles, either normally open or normally closed. The 2-way is the same valve except that the exhaust port is plugged. It makes an efficient and rugged combination when used



as a pilot for Valvair cylinder or diaphragm operated valves. VALVAIR CORP., 952 Beardsley, Akron 11, Ohio.
Circle Inform-A-Gram No. A14.

END MILLS and HOLDERS — by Reltool

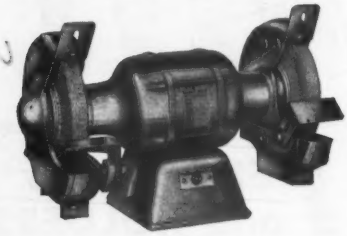
Precision processed of finest high speed tool steel, and scientifically heat treated for long cutting life . . . *Reltool End Mills are famous for long cutting life. Available* in single- and double-end types, in small and large diameters, with 2, 3, and 4 flutes, with straight or ball ends, in *over 1000 stock sizes.*

• RELTOOL END MILL HOLDERS are made in both Tang and Draw Bar Style, and with Morse or Brown & Sharpe Taper. Sizes over ¾" have Dual Set Screw. For complete list of sizes and prices see Reltool Catalog No. 50 and latest Discount Sheet.

Reltool CORPORATION
RELIABLE METAL CUTTING TOOLS
4540 W. BURNHAM ST. • MILWAUKEE 46, WIS.

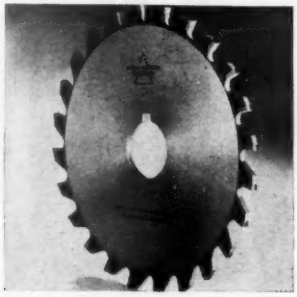
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Wide Clearance Type Grinders make up a new Baldor Electric line. This line includes 6", 7" and 8" sizes, each size featuring long distance between wheel centers that provides wide clearance between the wheels and the motor frame. In addition, the motor frame is considerably smaller in diameter than the grinding wheel. Accordingly, long objects can be pressed against both grinding wheels without touching the motor frame. Additional features include ball bearings that require no lubrication for their entire life, and heavy cast iron guards. BALDOR ELECTRIC CO., 4369 Duncan Ave., St. Louis 10, Mo., will provide a copy of illustrated Bulletin No. 353.



Circle Inform-A-Gram No. A15.

A New Carbide-Tipped Metal Slitting Saw for complete roughing and finishing, slitting and grooving operations in steel, cast iron, aluminum and other non-ferrous materials, is announced by North American Products Co.



This new blade has taken production cuts in cast iron 6¾" deep; in steel, 2¼" deep, and has held size to .002" on slots 4½ ft. long. For more detailed information, write to NORTH AMERICAN PRODUCTS CO., 3103 W. Cherry St., Milwaukee 3, Wis.

Circle Inform-A-Gram No. A16.

Columbia

TOOL STEELS FOR
All Tools for All Purposes

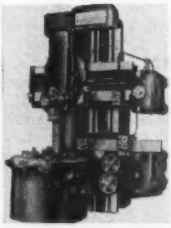
CARBON GRADE:
Special, Extra, Extra Header Die, Waterdie Extra, Vanadium Extra, Standard.

TOOL COLUMBIA STEELS

COLUMBIA TOOL STEEL COMPANY
Main Office & Works
Chicago Hgts. 5, Ill.

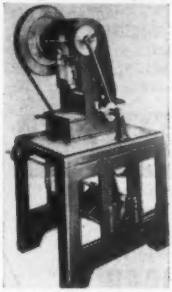
EISLER JIG BORING
CAM MILLING
A SPECIALIZED ROWBOTTOM CAM MILLING SERVICE... JIG BORING... SPOT WELDING... CONTRACT PRODUCTION ... EXPERIMENTAL DEVELOPMENT
EISLER ENGINEERING CO. INC
732 S. 13th Street (Avon Ave.)
Newark, N. J.

T NUTS
Stud Sets
Strap Clamps
SURE GRIP STEP BLOCKS
TIETZMANN TOOL CORP.
315 N. Main St., Englewood, Ohio



Froriep Single Column Vertical Boring and Turning Mills are ruggedly constructed to provide precise machining, extremely smooth surfaces and maximum cutting efficiency with carbide or high speed tools. The rigidly bolted bed and column and wide base are heavily ribbed for quiet machining, even under heaviest loads. The cross rail slide head and the side arm head are completely indepedent. Each is controlled by an individual set of rapid return gears. Write COSA CORP., 405 Lexington Ave., New York 17, N. Y.
Circle Inform-A-Gram No. A17.

The Automatic Flexo-Press of Ace Tool & Die Works has been redesigned and is now showing outstanding results on small cutting, perforating and stamping work. It has an infinitely variable speed range from 150 to 600 rpm, cuts production materials such as wire, light metals, etc., in uniform lengths up to 9". It stamps and forms small light parts such as connectors and springs, and does continuous high speed perforating with production rates of 9000 to 36,000 pieces per hour. ACE TOOL & DIE WORKS, 132 E. McMicken Ave., Cincinnati 10, Ohio.
Circle Inform-A-Gram No. A18.



"Group-Mounted" and "Chisel-Face" Wheel Dressing Tools are two additions to the line of Christensen Diamond Tool Co. Both types utilize a number of whole diamonds, mounted in a powdered metal matrix called C-Metal. Group-Mounted Tools are recommended for large O.D., straight-face applications where high finish is required. Each tool contains five, six or seven diamonds, so arranged that three to five points are in contact with the work at all times. Chisel-Face Tools have two or three diamonds mounted in a straight line, and are primarily intended for large-diameter, wide-face dressing applications. Write to CHRISTENSEN DIAMOND TOOL CO., 9607 Traverse St., Detroit, Mich., for more data.
Inform-A-Gram No. A19.

The efficiency, speed and accuracy of Oliver Die Making Machines effect time and cost savings up to 60%. So simple to operate, skilled labor is not required for sawing, filing and lapping operations. World-wide use in thousands of plants attests to their efficiency — many Oliver Die Makers have been in continuous use for more than 25 years. Find out for yourself why we say . . . Be Wise, OLIVERize — Use Oliver Die Making Machines.

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

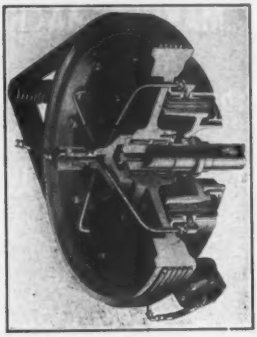
***Write Today For Complete Technical Data on* OLIVER DIE MAKERS**

OLIVER INSTRUMENT CO.
1410 E. MAUMEE • ADRIAN, MICHIGAN

Die Files

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

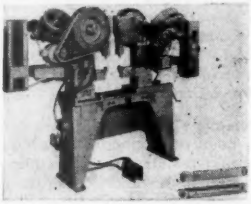
The Press-Rite Airflex Air Friction Clutch and spring and air-applied brake combination features: interlocking clutch-brake action;



long, maintenance-free life; and increased operator safety. This new clutch-brake arrangement is now available as optional equipment with certain Press-Rite power presses. SALES SERVICE MACHINE TOOL CO., 2363 University Ave., St. Paul, Minn., can supply further information and descriptive literature.

Circle Inform-A-Gram No. A20.

Two New Double "Clinchor" Units have been furnished to Ternstedt Div., General Motors Corp. They are tooled to feed and set two $\frac{3}{8}$"x$\frac{1}{2}$"x$\frac{3}{16}$" thick Fabri-Steel nuts at each operation. The anvil position of the left-hand machine is adjustable in a front-to-back direction, and also with respect to height. The anvil position of the right-hand Clinchor is adjustable in a left-to-right direc-



tion. For details, write TOMKINS-JOHNSON CO., Dept. T&P, Jackson, Mich.

Circle Inform-A-Gram No. A21.

CHICAGO DIES
Complete Line of
PUNCHING and FORMING DIES
for All Sizes and Makes of
PRESS BRAKES
DREIS & KRUMP
MANUFACTURING COMPANY
7428 S. Loomis Blvd., Chicago 36, Ill.

EXTRA HARD! EXTRA TOUGH!
Longer Life Between Grinds!
for.. .... Die Sinkers
Millers
Duplicators
Pantographs
BLACK STRAND
CUTTERS-BLANKS
Write for Literature and Prices
EDWARD D. STRAND COMPANY
Box 54, West Side Sta., Worcester, Mass.

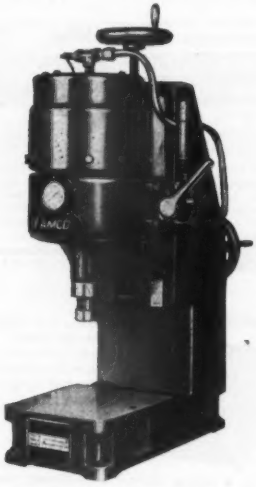
Milling Cutters

SUPEREAM
REAMERS IN *Decimal* SIZES
From .032 all the way up—Blanks can be ground to your exacting specifications and delivered in approximately 10 days. By purchasing SUPEREAM REAMERS in steps of .001 you SAVE—Time, Labor and Money in the cost of extra machining and lapping. SUPEREAM REAMERS all have ground and polished flutes and are held within .0002 tolerance. REAMERS are also furnished in Right-hand spiral, right-hand cut, as well as Left-hand spiral, right-hand cut.
Write for descriptive literature and prices.
IN EMERGENCY PHONE
INDEPENDENCE 3-9180
TWENTIETH CENTURY
MANUFACTURING CO.
1725 MONTROSE AVENUE CHICAGO 13, ILLINOIS

A-DUSTKOP Dust Collector designed for the out-of-doors exhaust of air that has been cleaned of industrial dust, but which still contains toxic fumes, is available for use on 25 cycle power. Being a standard unit, new Model 20ND30 has a predetermined capacity, and being available from stock, it can be put into immediate operation with predictable results. Capacity of the unit is 2450 cfm on a single 6" inlet, with a 4.5" static suction. Address AGET-DETROIT CO., 213 Main St., Ann Arbor, Mich.

Circle Inform-A-Gram No. A23.

An Air Press has been added to the Famco Machine Company line. Twenty models are included with ½ to 3½ ton capacities. A highlight is the frictionless cylinder of diaphragm design, requiring no lubrication of any kind. All models have a built-in pressure gage, infinitely adjustable stroke coupled with extra-long maximum strokes, ram keyed



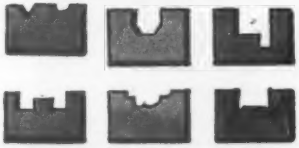
to prevent rotating, large working surface, and infinitely vertical adjustment with no bolts to loosen or remove. FAMCO MACHINE CO., 1344 18th St., Racine, Wis.

Circle Inform-A-Gram No. A22.

NEW-FIELD

UNIVERSAL FLY CUTTER

Above: FACE MILLING



ABOVE—a few of the many cuts that can be made with the Newfield Universal Fly Cutter in ONE operation on a horizontal or vertical mill or drill press. Individual adjustable bit holders permit slots of any shape to be cut 3/16" to 2" wide.

STANDARD BITS MAKE 4 TO 6 DIFFERENT CUTS IN 1 OPERATION

For many types of milling, light metals and plastics as well as steel, there is no longer need for special cutters. A single Newfield Universal Fly Cutter, utilizing any type of standard high speed steel or carbide bits, makes multiple cuts in one operation. In contrast with expensive specially ground cutters, the standard bits used in the Newfield are easily and quickly ground in your own shop, readily replaced or reground for other work, at small cost. There is practically no down-time if a bit is broken.

The Newfield fits all standard arbors, turns to any required speed for fly cutting, slotting, surface and straddle milling, gear cutting, disc and gasket cutting. Standard sizes are 4", 6", 8", 10".

Write today for details of this versatile, production-upping, money-saving tool.

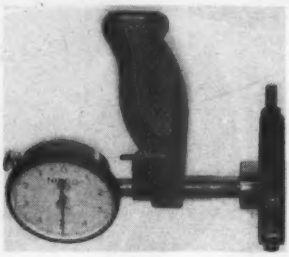
NEW-FIELD MACHINED PARTS CO.

210 W. Seventh St. . . Los Angeles 14, Calif.

Fly Cutter

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

The Nilco Pistol-Grip Bore Gage has been designed to check bores on the machine by the operator where space is limited and it is impractical to use a standard length bore gage. A highlight is the positioning of the indicators to the proper angle so that the gage will face the operator at all times and the adjusting of the handle to the proper checking depth.



Other construction features of this Nilco gage include three-point alignment, two-point gaging and the interchangeability of parts. Literature is available from NILSSON GAGE CO., INC., P. O. Box 505, Dept. T&P, Poughkeepsie, N. Y.

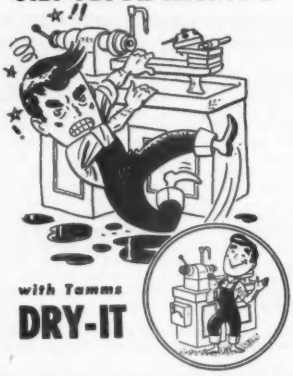
Circle Inform-A-Gram No. A24.

A New High Speed Hydraulic Copying Lathe has been introduced in this country. The H.E.B. Model OP achieves complete elimination

of vibration even at its top spindle speed of 3600 rpm, giving maximum output from carbide and diamond tools, for which it was designed. The copying device is an integral part of the machine and has great sensitivity, thus resulting in extreme accuracy. H.E.B. MACHINE TOOLS, INC., 341 Madison Ave., New York 17, N. Y., will furnish a catalog.

Circle Inform-A-Gram No. A25.

STOP
OILY FLOOR MISHAPS

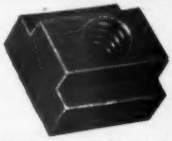


with Tamms
DRY-IT
Write Dept. 3 for FREE sample
TAMMS INDUSTRIES, Inc.
228 N. La Salle St., Chicago 1, Ill.

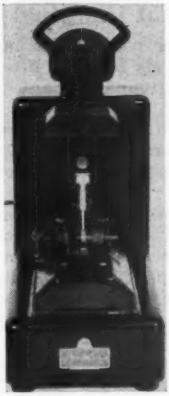
"THE ORIGINAL" MAUSER
MAUSER PRECISION VERNIER CALIPER

$14.75 PPD
MONEY BACK GUARANTEE FOR MEASURING INSIDE, OUTSIDE, AND DEPTH.
3 GRADUATIONS 1/1000" — 1/128" 1/10 mm. IN BACK
NEW EXCLUSIVE GAMLOCK AND GIB IMPROVEMENT INSTANTLY FIXES SETTING, PREVENTS SHIFTING, GUARANTEES SQUARENESS OF JAWS.
THE MAUSER TRADEMARK... IS YOUR PROTECTION.
GEO. SCHERR CO. INC. 208-T LAFAYETTE ST. • N.Y.12, N.Y.

SEND FOR FREE CATALOG TODAY

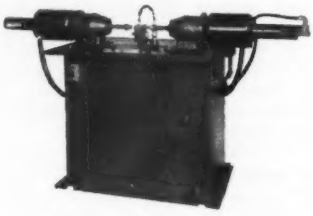


T-NUT & STUD SETS
STEP BLOCK SETS
PUNCH PRESS SETS
QUARTER TURN SCREWS
SHOULDER SCREWS
DOUBLE END JIG FEET
SCREW TYPE JIG FEET
PRESS TYPE JIG FEET
FLANGED NUTS
CUT THREAD STUDS
TEE-NUTS
COUPLING NUTS
ADJUSTABLE STEP BLOCKS
STAR TYPE HAND KNOBS
HEXAGON TYPE HAND KNOBS
KNURLED HEAD SCREWS
Northwestern
116 HOLLIER AVE., DAYTON 3, OHIO



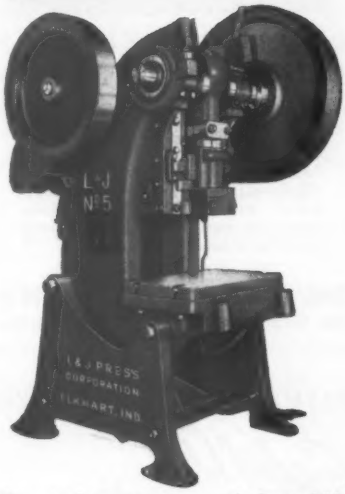
The Electrolimit Internal Clearance Comparator-Lever Type measures the radial play of instrument-type ball bearings. With interchangeable tooling it will handle bearings from $\frac{3}{32}$" to ½" bore. The chief part is the C-shaped sub-assembly. The bottom of the assembly is fitted with an arbor that holds the bearing vertically by its inner ring so that the outer ring is free to move according to the amount of radial play. A gage head is attached to the upper portion of the C-frame so that its diamond-tipped gaging spindle bears against the top of the outer bearing ring. This presses the outer ring to "down" position with all clearance at the bottom. At this point the first of two comparative readings is taken. PRATT & WHITNEY, 15 Charter Oak Blvd., W. Hartford 1, Conn.
Circle Inform-A-Gram No. A26.

A New Machine for opposed drilling and counterboring operations in sequence has recently been announced by Govro-Nelson. The setup pictured incorporates two Govro-Nelson Model HH Units wired to operate automatically in sequence. The operator loads the small steel part in the fixture and touches



the start button, whereupon one unit drills a No. 44 hole and a No. 30 counterbore with a combination tool. When this operation is completed, the second unit comes in from the opposite side and reams part way a No. 38 hole .004" off the center line of the first drilling and counterboring operation. By varying the position of the units and the tools employed, the user can adapt this machine to other operations. GOVRO-NELSON CO., 1933 Antoinette, Detroit 8, Mich.
Circle Inform-A-Gram No. A27.

L&J PRESSES
Better-Built for Better Work



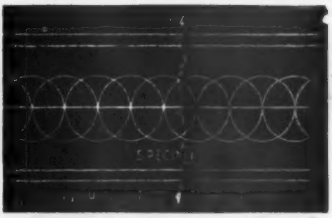
The rigidity, accuracy and dependable performance of L & J Presses will pay off for you in better work. You'll get close tolerances, long die life and high output. They are designed right and built right to efficiently fill your stamping and drawing needs—and with a minimum of attention.

L & J Presses are made in 12 O. B. I. models—back geared and plain flywheel types—and 8 sizes—6 to 80 ton capacities.

Write for literature

L&J PRESS CORPORATION
1620 STERLING AVENUE
ELKHART, INDIANA

metal Markings



DYKEM STEEL BLUE
STOPS LOSSES
making dies and templates

Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY
2303L North 11th Street • St. Louis, Mo.

RAYMAC
Solid Carbide Drills

HERE AT LAST!

SOLID CARBIDE DRILLS, developed by RAYMAC . . . cut, do not burn thru hardened metals at slower speeds . . . give cleaner and more accurate holes . . . less drill breakage and longer drill point life.

WRITE TODAY:
for catalog No. 12 for further information about RAYMAC SOLID CARBIDE DRILLS!

RAYMAC
MANUFACTURING COMPANY INC.
3729 CASS AVENUE, DETROIT 1, MICH.

Air Hardening Flat Die Steel

An air hardening type of die steel has been added to the Simonds Saw and Steel Company's line of flat ground oil hardening die steel.

Its 5% chrome content makes the new steel more wear resistant than oil hardening types and therefore is ideal for punches and dies to be used on silicon or stainless steels, Monel metal or other types of abrasive metal since it will produce up to 50% more pieces per sharpening than the oil hardening type of die steel. It may also be used for gages, tools, etc., where a more wear resistant steel is desired.

This air hardening, non-deforming die steel is spheroidize annealed for good machinability and consistently uniform hardenability, and has the following chemical analysis: Carbon .95-1.05; Manganese .50-.70; Silicon .30-.50; Chrome 5.00-5.50; Molybdenum .90-1.10; Vanadium .20-.30. It has a wide hardening range (1700° to 1800° F.) which makes it practically fool-proof in heat-treating.

Produced in 43 standard stock sizes from ½"x2" to 2"x10" in 36" lengths, all sizes are accurately ground to a thickness limit of plus or minus .001" with an extra smooth surface finish of 25 to 35 micro-inches. Edges are parallel and square with flats. All scale, decarburization and surface defects are completely removed so that each piece is ready for scribing, shaping and heat-treating. All sizes are individually packaged, fully protected from rusting or scratching, with dimensions and heat-treating instructions on each wrapper.

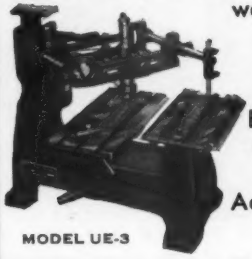
E. W. BLISS COMPANY has been awarded a $500,000 contract for the design and manufacture of hot strip mill auxiliary equipment in the Volta Redonda, Brazil, plant of Companhia Siderurgica Nacional (National Steel Company of Brazil). The contract, which covers a hot strip mill coiler, conveyors, tables and hot coil handling equipment, is part of a vast expansion program now in process by the Brazilian company.

The equipment will be built at Bliss' Rolling Mill Division in Salem, Ohio, with deliveries scheduled to begin late this year. The contract marks the resumption of Bliss-Brazilian business relations after a lapse of several years.

For-

PRECISION ENGRAVING

in STEEL other METALS and PLASTICS you can't beat the well-known PREIS-PANTO line of Engraving Machines and Accessories

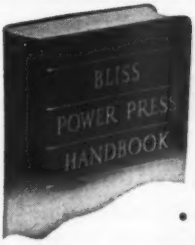


MODEL UE-3

PANTO

Write for latest UE-3 Color Folder

H. P. PREIS ENGRAVING MACHINE CO.
647 Route 29 Hillside, N. J.



JUST OFF THE PRESS!

Completely new

700 Pages
450 Illustrations
Sections on:

- **Easy methods of computing press jobs**
- **How to select the proper type of press**
- **Useful engineering tables**
- **Die illustrations**
- **Glossary of terms used in the pressed metal industry**

Plus a complete service section covering all types of Bliss presses, old and new. $7.50

E. W. BLISS CO., Handbook Department
1352 Raff Road, S. W. Canton, Ohio
Rush me a copy of the Bliss Power Press Handbook

_____
_____
_____
_____

I am enclosing $7.50 ☐ **Bill me** ☐

BORING BAR HOLDERS

PRECISION-SET IN A JIFFY

for PRODUCTION BORING ON TURRET LATHES

The idea's so simple and proven-practical, we wouldn't charge a thing for it were it not for EVEREDE building the holder itself. If you're stymied for production-boring and have Turret Lathes available . . . here's your answer . . . already proven in some of the biggest and busiest plants around the country.

You just jiffy-slap the holder in the precision setting you want . . . and it's there to stay. You can't miss. You ***EveredE-Guaranteed*** can't miss!

WRITE FOR DETAILS

THESE WAYS BETTER:

- *Saves "Fiddling" set-ups. No shimming . . . no "home made" improvising or grinding down of bars.*
- *Quick, easy adjustment for centering.*
- *Supplied with bushings, accommodating various sizes of straight shank boring bars.*
- *Made of tough, durable heat-treated cast steel to rigid specifications.*

EVEREDE Tool Co.
2000 North Parkside Avenue
Chicago 39, Illinois

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

FREE

EUTECTIC "TOOL & DIE SALVAGE MANUAL"

JUST OFF THE PRESS VOLUME II OF THE EUTECTIC

NATIONAL DEFENSE SERIES

EFFECTIVE TOOL & DIE SALVAGE METHODS SAVE THOUSANDS OF DOLLARS

Yours, FREE for the asking—this new, concise, thorough book—jammed to its covers with over 40 pages of practical data, charts, and salvage welding "case histories" supplemented by revealing on-the-spot photographs—explained clearly, simply, fully!

This all-new, digest-size manual thoroughly explains the cost-cutting procedures evolved from more than 10 years of EUTECTIC'S continuous welding research and now in effect in scores of leading plants using and manufacturing tools and dies.

All this easy-to-understand, easy-to-apply information is offerred to you NOW without cost and without obligation of any kind!

PARTIAL LIST OF CONTENTS

This new book, the second of EUTECTIC'S comprehensive National Defense Series, covers such timely salvage and repair topics as: Repair procedures for high speed steel tools and dies. Heat treatment of welded tools. Salvage of Shoe, Kirksite, and Cast Iron dies. Metallurgical aspects of welding tool and die steels. Nomenclature. Correcting design methods. Hard facing procedures—*and dozens more!*

MAIL COUPON TODAY FOR YOUR FREE COPY

EUTECTIC WELDING ALLOYS CORPORATION

America's Leading Institute Devoted to the Research and Manufacture of Specialized Metal Joining Alloys.

40-40 172nd Street
Flushing ● New York

This new "Tool & Die Salvage Manual" of yours sounds like a very helpful book. Send me a FREE copy with the understanding that there will be no cost or obligation now or later. (2)

Signed_____

Firm_____

Address_____ Zone_____

City_____ State_____

Carbide Milling of Die Blocks at Fast Feed Rates

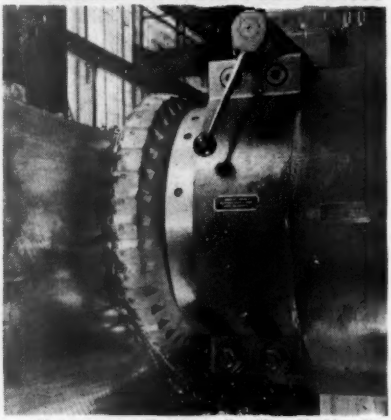


Photo courtesy The Ingersoll Milling Machine Co.

This striking shot of a 24" Shear Clear carbide face milling cutter shows how the chips coil evenly out along the blades away from the finished surface and are thrown clear of the cutter at the end of the cut. Feeding 10 times faster than with tool steel, the Shear Clear, backed up by 60 hp, machines 15,000 sq. in. tough material in 10 hours without regrinding. The die block surfaces range in hardness from 300 to 375 Brinell. Cuts 22" wide are taken and good finishes are obtained.

YOST DRILL PRESS VISE

● **This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.**

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	8½	23

Do you need a vise of ANY type?

Write today for bulletin on the extensive Yost line

YOST MFG. COMPANY
1000 MAIN STREET
MEADVILLE • PENNSYLVANIA

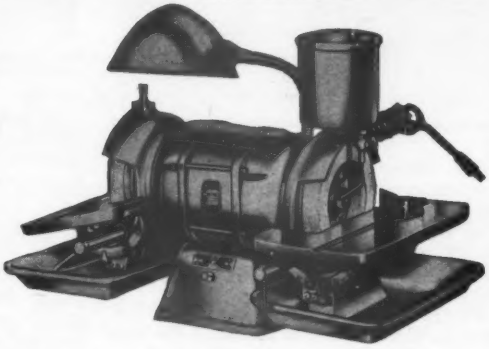
Baldor

Carbide Tool Grinder

has balanced armature and wheels, LARGE ball-bearings for precision work. ½ HP 3400 RPM reversible motor for sharpening both left and right hand tools. Grinds wet or dry. 6" silicon carbide wheels.

$142.60 complete.

Mail this ad for Bulletin 341-B



BALDOR
ELECTRIC CO.
4369 Duncan Ave., St. Louis 10, Mo.

NEW LEITZ
TOOLMAKER MICROSCOPE

...PRODUCES HIGHEST PRECISION
....CUTS INSPECTION TIME

The NEW LEITZ DESIGN checks angular measurements in degrees and minutes.

Contains all Thread Templates for U.S. National thread profiles 6-60 pitch.

Contains Radii Templates from 21/64" to 13/16" by 1/64". Concentric circles from .010" to .200" by .010" and one blank compartment.

NOTE: TEMPLATES CAN BE OBSERVED IN 3 MAGNIFICATIONS: 10X - 20X - 30X

BE SAFE — SEND FOR LATEST BULLETINS

GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200 -T LAFAYETTE ST. • N.Y. 12, N.Y.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

A Fast Method of Forming Wheels

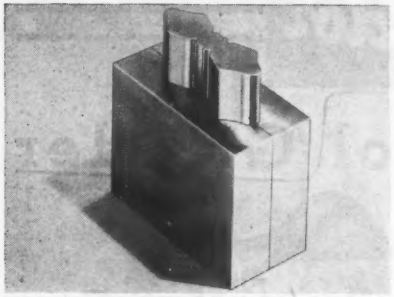


Fig. 1. Example of split blanking die and punch.

The Diaform method of grinding wheel forming meets today's demands for savings in time and increased productivity. The Diaform attachment performs the job of profiling the wheel by means of template, pantograph linkage and diamond dresser.

Figure 1 shows an assembly of finished parts, a simulated split blanking die and punch, which was ground by the Diaform method. This job is accurate to less than .0005" and has the punch and die clearance called for by stock .004" thick.

In Figure 2, template "A" is a ten times enlargement of the job and is made by conventional methods from 3/32" flat stock. The mating or female template "B" is easily cast in type metal by using the simple casting flask shown in Figure 3. Figure 4 shows the Pratt & Whitney Dia-

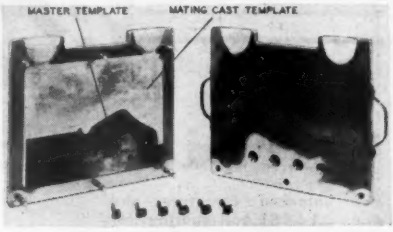


Fig. 3. The simple flask for casting the mating templates in low temperature type metal.

form attachment in place on a surface grinder. The operator is forming the wheel to the punch profile by guiding the tracer stylus along the edge of template "A". Through the pantograph linkage, movement of the tracer is reduced 10 to 1 at the dressing diamond point seen in the background under the wheel.

The diamond point terminates at the short arm of the pantograph and its movements are one-tenth those of the manually traversed stylus. Figure 5 shows the diamond point finishing the wheel form in correspondence to the relationship of stylus and template in Figure 4.

Accurate positioning of the Diaform wheel forming attachment on the grinder table or chuck in relationship to the wheel is assured by a simple gage which en-

(Continued on page 226)

Fig. 2. Template "A" is handmade from 3/32" flat stock; template "B" is cast in type metal.

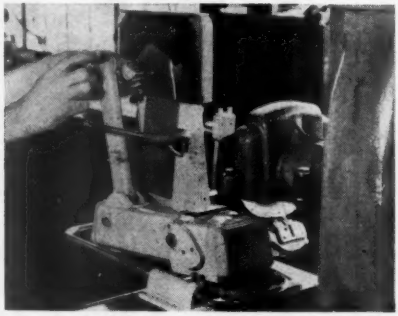
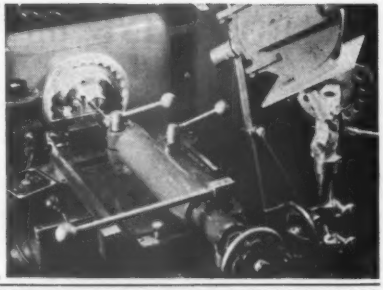


Fig. 4. The Diaform wheel forming attachment in working position on surface grinder table.

Our error and apologies . . .

The picture at the right appeared on page 210 of our 4th Annual QUALITY CONTROL Feature Issue. It was Figure 4 of John Waddell's Article, "High Speed Photography Applied to Production Quality." In it the lathe was incorrectly named. We trust our readers readily identified it as a Lees-Bradner precision lathe.



ETALON No. 9 $37..30 F.O.B., N. Y.

.001" and 1/64"

HARDENED STAINLESS STEEL

Overall Length 10". Measuring Capacity is 7". Width of Nibs when closed is ¼".

Known the world over for fine accuracy. Hand fitted vernier assures smooth, snug operation. COMPLETELY GUARANTEED. Furnished in handsome form fitting wooden case.

ASK YOUR DEALER or write

ALINA CORPORATION • 32 BROADWAY • NEW YORK 4, N. Y.

Foredom FLEXIBLE SHAFT MACHINES

PROVIDE MORE POWER — LONGER MOTOR LIFE

BECAUSE UNLIKE conventional type grinders MOTOR is NOT DWARFED to fit the hand!

YOU GET *more precise control and unobstructed view* of your work because of FOREDOM'S small-as-a-pencil handpiece which provides marvelous, effort-less operating ease.

For Every "SMALL-WORK" Job of GRINDING and FINISHING

2-WAY USEABILITY—Hang it up on any convenient hook or suspend it from a shoulder strap.

ALL 3 DEPARTMENTS—Maintenance, Production, Tooling, can make profitable use of FOREDOMS. At their low cost, you can afford to spot them liberally about the plant for emergency and every day use.

THE SECRET'S IN THE PENCIL SIZE HANDPIECE!

MODEL 100 (illustrated) 6-step foot rheostat $5.25 extra. Your choice of 3/32" or ⅛" collets. Add 85c if you want both. $17.75

Other heavier duty models, bench and hang-up types, with your choice of quickly - interchangeable handpiece types at proportionately modest prices.

★ *Quality Tested Since 1922* ★

See Your Industrial Supply Distributor—If He Cannot Supply You Write to Us

MAIL COUPON FOR CATALOG

FOREDOM ELEC. CO., Dept. M-1750 Name .....

27 Park Place, New York 7, N. Y. Address .....

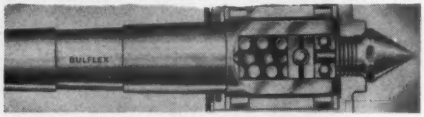
Send your catalog No. M-1750 City & Zone..... State.....

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

INTRODUCING the *NEW* Ultra-Accurate!

Bultool SPRING-LOADED PRECISION LIVE CENTERS!

- POWERFUL SPRING CONTROLS ALL END THRUST
- MASSIVE ROLLER BEARINGS ASSURE SUSTAINED ACCURACY
- GUARANTEED ACCURACY .0002" TOTAL RUNOUT

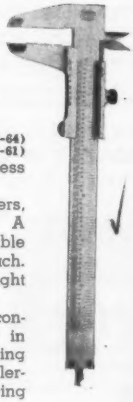


DEALER INQUIRIES INVITED . . . .

STANDARDS and SPECIALS
—ALSO—
FULL AND HALF DEAD CENTERS
FAST SERVICE . . . . !
WRITE FOR LITERATURE AND OUR BEST QUOTATION

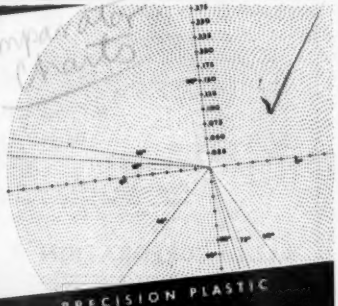
THE Bultool COMPANY
9101 EAST JEFFERSON AVENUE
DETROIT 14, MICH. VALLEY 1-4900

M Z B Precision Vernier Calipers
Accurate — Dependable
$14.00



A tool to comply with the most exacting demands.
Measures inside, outside and depth. 6" scales.
Measuring capacity 5¼"
Graduations to read;
.001" and 1/20 m/m (Cat. %30-64)
.001" and 1/128" (Cat. %30-61)
Both models also in stainless steel. **$16.50** each.
In stock; M Z B micrometers, 1" size to read .0001". A very fine tool comparable only to the best. **$15.00** each.
Also 12" calipers and height gages.
We are interested in contacting representatives in various territories, regarding a representation or dealership for MZB fine measuring tools.

Inter-Continental Trading Corp.
90 West Street, New York 6, N. Y.



PRECISION PLASTIC
Comparator Charts
FOR ALL MAKES AND MODELS
OPTICAL PROJECTORS
Non-breakable, extremely accurate and available in standard magnifications — radii, protractors, screw and pipe thread layouts in stock.
WRITE FOR CATALOG AND LIST
Gage COMPANY
BATTLE CREEK, MICH.

RUNS COOL AT 38,000 RPM

Roto-Master Hi-Speed grinder makes carbide roughing and finishing available to every shop. Designed for operations requiring precise "finger-tip" control, in conjunction with carbide burrs and mounted wheels from 1/16" to ¼" dia.

MAKES CARBIDE ROUGHING AND FINISHING AVAILABLE TO EVERY SHOP

Roto-Master's SUPER COOLING system enables operating speed of 38,000 RPM. Operation requires practically no pressure . . . consequently grinder can be used continuously for hours without heating.
Operates on 110-120 Volt AC or DC, Any Cycle.

Try Roto-Master in your shop. If not completely satisfied return within 15 days at no charge. If not rated send check or M. O. for $32.50. Manufacturers' Agents Wanted.

$32.50

MASTER APPLIANCE MFG. CO., 4th at Ontario, Racine, Wisconsin

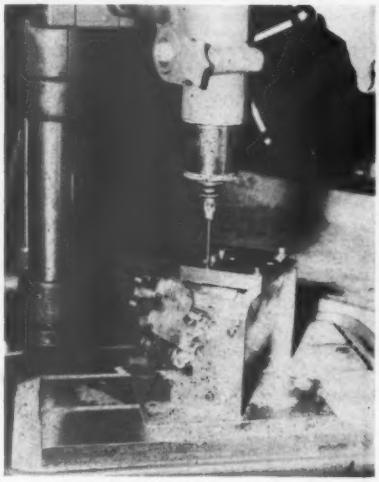
PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

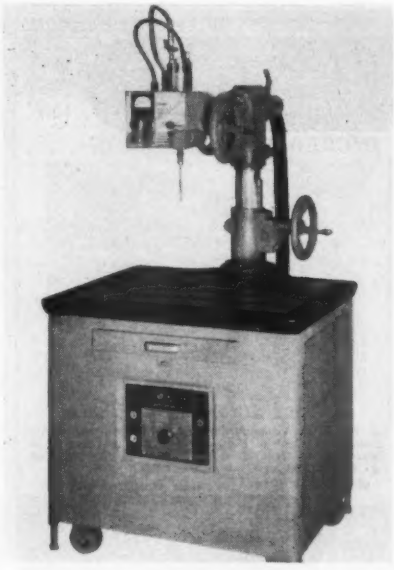
Machining Carbides by "Metalmaster" Disintegration

The cutting of carbides has developed into one of the more important features of the new metal disintegrator known as the Thomas Metalmaster. The actual theory of metal disintegration as produced by this equipment is that a thermal shock is produced when the metal is heated with the hollow electrode and then is suddenly cooled. This treatment disrupts the bonding of the metal molecules and disintegration of the area subject to the heating takes place.

Carbides can be cut faster with this disintegrator than steel, although the carbides are harder than steel. The reason for this is that the bonding of the molecules in carbide is more susceptible to the thermal shock caused by this treatment than takes place in tool steel.

In the operation of the disintegrator shown at the lower left, the hollow electrode carries both an electrical current and a coolant which flows through the center of the electrode. The electrical current heats the material directly below the electrode and the coolant flowing through the center of the electrode instantly cools the heated material. Thus a thermal shock is set up and disintegration is the result.





The experience of many companies shows that the disintegration method will materially decrease the cost of machining carbides. This is particularly true in roughing out carbide dies in which the major portion of the material is removed by disintegration and the final lapping and the final finish are done with diamond tools.

Die corrections can often be made by use of the disintegrator without affecting the temper, and additional holes can be produced in almost any shape.

The original disintegrator was developed to remove broken taps from workpieces and since the inception of the disintegrator equipment, the salvaging of parts in many large corporations has been reduced from $35 a man to as low as $8 a man in a short period of time.

Shown at the upper right is a Thomas Metalmaster set up to remove a tap from a defense work-part valued at $400 that might otherwise have to be scrapped.

Complete information and specifications are available from Warner Div., Clinton Machine Co., 21535 Groseback Ave., Detroit 5, Mich.

Circle Inform-A-Gram No. D1.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

PRECISION VERNIER CALIPERS

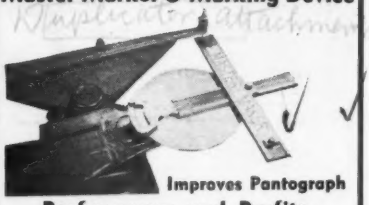
The TUNA Precision Vernier Calipers are made of best Swedish steel with hardened measuring surfaces.

Measuring length ..... 5⅞"
Graduated in ..... .001"
Depth of jaw (external) ..... 1⅝"
Depth of jaw (internal) ..... ⅝"
Depth of measurement from ..... 0 to 5⅞"
Net weight ..... 5 ounces

HIGH QUALITY • LOW PRICE, $9.75 • IMMEDIATE DELIVERY
Leatherette Case for Calipers, $1.00

SWEDISH GAGE CO. OF AMERICA — **8900 Alpine Avenue**
C. E. JOHANSSON GAGE CO.—A DIVISION — Detroit 4, Michigan

Master Marker & Marking Device



Improves Pantograph

Performance and Profits.

Precision work at any angle . . . Tracer control with rotary table performance . . . speed and accuracy assured . . . adaptable to all 2 and 3 dimensional engraving machines. Send for literature.

FRYER TOOLS & INSTRUMENTS
188 N. Wells Street • Chicago 6, Illinois

DANFORTH DIAMOND POWDER

DIAMOND POWDER

Sieve and Micron Sizes
Closely graded and Purified

Complete Powder Reclaiming Services for Sludges, Used wheels, Lapping Cotton

Write for Prospectus

C. W. DANFORTH CO.

(Established 1912)
Box 448, Youngstown, Ohio

DANFORTH DIAMOND POWDER

DID YOU KNOW? The Hager

UNIVERSAL CARBIDE GRINDER

with the Patented RECIPROCATING ACTION

. . . Has a CHIP BREAKER ATTACHMENT and table for small radius grinding as STANDARD equipment.

Write for details!

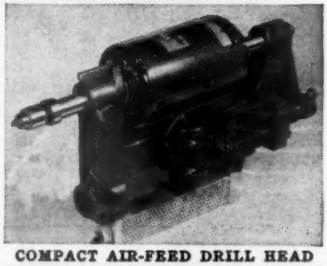
HAGER

E. F. HAGER AND SON
QUEENS VILLAGE 9 • NEW YORK
Mfrs. of Hager Measuring Microscopes

"Speed-Right" DRILLING MACHINES

.004" to .156"

INCREASE PRODUCTION . . .



COMPACT AIR-FEED DRILL HEAD

• Fingertip Variable Speed • Fast Approach Air Feed • Hydraulic Feed Adjustment • Electric or Manual Control • Deep Hole Drill Cleaning • 1000-10,000 or 2500-15,000 RPM.

Write for "Five Steps to Better Drilling"

THE ELECTRO-MECHANO CO.
260 EAST ERIE STREET
MILWAUKEE 2, WISCONSIN

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

. . . Armor Steel, from page 142

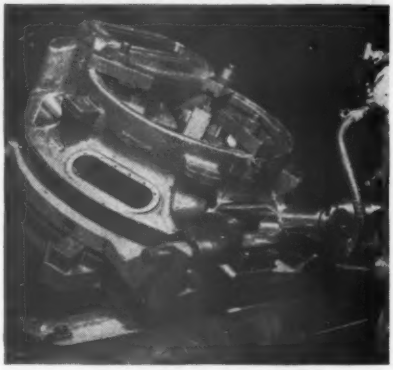
the ends of the opening. This was done by mounting a two-spindle head on a 36/72 horizontal, locking the vertical travel of the head and longitudinal travel of the table. Two special inserted type carbide-tipped cutters are used, Figure 15. Previous to the use of carbide, high speed steel single point blades were used. After conversion to carbide a time saving of over 75% was experienced. It can be noted that quick-change arbors are used.

The second phase consists of roughing the opening. The vertical movement of the head on a 36/72 horizontal miller was locked in position. A special inserted blade carbide-tipped integral shank end mill of the proper diameter is used.

The third phase is the same as the second except that the end mill is also used to bore the end to size, Figure 16.

Initially, appreciable trouble was experienced in this operation as to holding size. Taking recourse to statistical quality control, an Average and Range chart was set up to determine if the machine and operation were truly capable of holding size. It was found that the ranges were well within blue print limits but that the prism opening size was actually above blue print limits. By changing cutter size, as indicated by the chart, this operation was finally brought under control.

Fig. 16. The third phase of machining the prism openings, i.e., end-milling the ends of the openings to finish size. This entire operation presented such size-holding difficulties that Q-C Average and Range charts were employed to determine if the machine and operation were actually capable of holding size.



The subsequent operations consist of drilling and tapping. After all machining, the casting is washed, deburred, inspected and then sent to assembly.

WHITNEY - JENSEN PRODUCTS
41 YEARS EXPERIENCE

No. 5 JR.
HAND PUNCH

A lightweight tool that has found wide acceptance because it is durable, powerful, easy-to-use. The No. 5 Jr. has an adjustable locating stop clearly graduated to permit quick setting to any throat depth up to 2". Furnished complete with seven punches and dies in strong metal carrying case. Capacity—¼" hole through 16 ga. mild steel.

Overall Length—8¼"
Height of Gap—¼"
Weight—2¾ lbs.

Write for our latest catalog.

WHITNEY METAL TOOL COMPANY
724 FORBES STREET • ROCKFORD, ILLINOIS

. . . Wheel Forming, from page 220

Fig. 5. This shows how the diamond dresses the wheel profile according to the travel of the tracer stylus along the edge of the master template, Figure 4, at ten to one reduction.

ables the diamond to be brought directly beneath the centerline of the wheel spindle.

The wheel form is started by a roughing diamond which is located central to the diamond spindle centerline by means of a .0001" dial indicator. After roughing, the roughing diamond is replaced by two finishing diamonds, Figure 6, and each is adjusted to obtain a zero reading on the "tenth" when rocking the diamond arm about its axis.

After the wheel is fully dressed, the Diaform is removed from the grinder

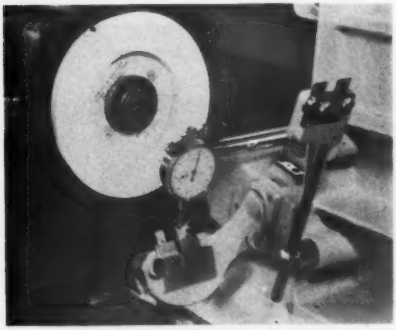


Fig. 6. The tandem diamond block is an important factor in diamond conservation. With a worn diamond used for semi-finishing, and the other having a true radius for finish truing, a minimum amount of abrasive is left for the true diamond to remove. This is particularly important when grinding tungsten carbide.

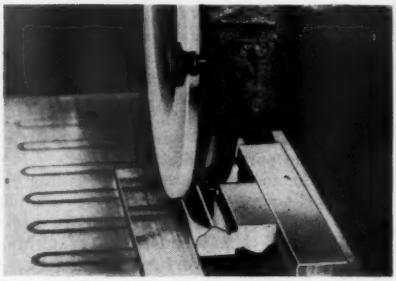


Fig. 7. The grinding of one quarter of punch form at a time; first roughing, then finishing.

chuck and the hardened punch blank is placed on the magnetic table. In this example, the punch is of a symmetrical shape so that the one punch template serves for each of the four quarters of the punch profile. Plunge grinding is employed, grinding one quarter of the punch form at a time as shown in Figure 7.

After rough grinding the complete form to within a few thousandths of finish size, the Diaform is returned to the table, the wheel retrued, and the punch form is finish ground to size.

In grinding the split die sections, template "B" is cast from template "A" and the same wheel roughing and truing procedures are followed. Figure 8 shows the setup for grinding one of the die halves.

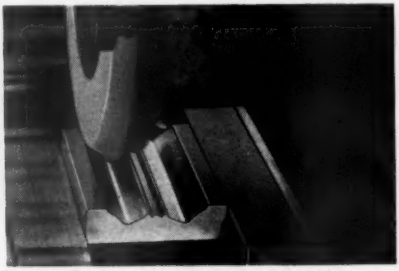


Fig. 8. The same procedures are followed in preparing to grind the split die sections.

Diaform photos, courtesy Pratt & Whitney Division Niles-Bement-Pond Co.

Files: Rotary

Stellram
TUNGSTEN & MOLYBDENUM, LTD.
NYON, SWITZERLAND

Precision Machined
Solid Carbide Blanks

TO
EXACTING CUSTOMERS'
SPECIFICATIONS

SINTERED CARBIDE CORP.
WORTH 4-6815
149 BROADWAY NEW YORK 6, N. Y.

for fast... accurate... keen-cutting files specify haskins

Set G-501

When you want the finest in hand-cut, ground or carbide cutters, specify Haskins. They give you many advantages over ordinary files—faster cutting, longer tool life and fewer resharpenings—advantages that mean reduced costs, reduced labor and lower over-all tool costs.

Pictured above, set G-501, available also in hand-cut set H-501. For additional shapes, send for complete catalog—R. G. Haskins Co., 605 S. Washtenaw Ave., Chicago 12, Ill.

HASKINS haskins
FLEXIBLE SHAFT EQUIPMENT

SINTERED CARBIDE CORP.
WORTH 4-6815
149 BROADWAY NEW YORK 6, N. Y.

Solid Carbide Blanks
Precision Machined

TO
EXACTING CUSTOMERS'
SPECIFICATIONS

MADE BY

Stellram
TUNGSTEN & MOLYBDENUM, LTD.
NYON, SWITZERLAND

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

300% FASTER

With Spiral step tools.

For example you can drill multi-diameter holes and countersink or chamfer in one operation. Each tool is made special for the job to be done. Shown below are just a few of the special cutting tools which we make. Hundreds of other combinations to save you money.

Write for Bulletin No. 101.

SPIRAL STEP TOOL CO.
5400 N. DAMEN AVE.
CHICAGO 25, ILL.

Save TIME, SPACE & MACHINE TOOL BEDS WITH

OLD WAY

NEW

PO-RO Clamp Support Blocks

½" to 10" height (in 1/16" adjustments) with one set of blocks.

HARDENED STEEL
TRUE FLAT SURFACES
SLIP-PROOF SERRATIONS

$11.75 a set consisting of:
4 — No. 1 half blocks — ½" to 1"
4 — No. 2 half blocks — 1" to 2½"
4 — No. 3 half blocks — 2½" to 6½"

PODLIN TOOL CO.
3918 Wesley Terrace, Schiller Park, Ill.

Wear-Resistant Carbide As a Gage Block Material

Carbide has come up fast as a gage block material. Perhaps its greatest physical characteristic is its ability to resist wear.

Though carbide blocks cost approximately three times as much as steel, they last fifty times longer. This is, of course, an estimate since no exact figures have been accumulated.

However, a maker of inspection gages tells how their long wearing qualities can be especially valuable under the abrasive conditions of a lapping operation. Whereas steel blocks are replaced within a few

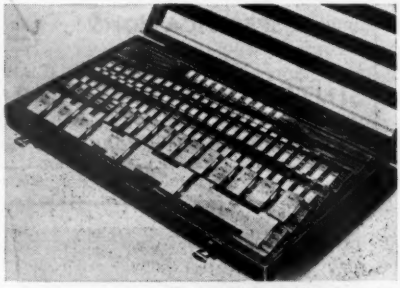


Photo courtesy Webber Gage Co.

months, the wear on a set of carbide blocks can still be measured in millionths after three years of continuous use.

Carbide is unquestionably superior when measuring in split-tenths. Not only can the user forget about the wear factor but their low coefficient of expansion makes it unnecessary to be ultra-careful about temperature changes.

It has been estimated that heat of the hand can increase the size of a 4" steel block .000052", e.g., from room temperature at 68° to transferred heat of hand reading 88°.

In a carbide block this expansion is less than one-half of that. Nevertheless, one make, Webber Gage Company, has added bakelite finger grips in their larger carbide blocks to further improve their precision. The trade name for these inserts is "Thermo-Guards."

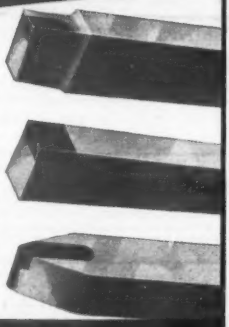
DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Penna.

New NESTING TYPE
TOTE PANS
20" Long x 12" Wide x 6¼" Deep
16 Ga., drag holes, handles both ends.
J. L. LUCAS & SON, INC.
BRIDGEPORT 5, CONN.

For PRECISION FINISHES on CARBIDE, TOOLS, DIES, Etc.
and
MIRROR FINISHES
. . . in minutes Instead of hours
"MICRO MESH"
PURE DIAMOND LAPPING COMPOUND
WILL SOLVE YOUR
LAPPING
PROBLEMS
write for details

A-1 ABRASIVE LABORATORIES
139 DUANE STREET NEW YORK 13, N. Y.

USE WILLEY'S GENERAL PURPOSE TUNGSTEN CARBIDE TOOLS!



Standard tools are available either from stock or on delivery dates that meet your schedules. Advance orders for shipment on definite dates help tremendously in serving you better. Send prints for quotes and delivery dates on special tools.

Catalog gives full information on standard tools and blanks, as well as gages, centers, broaches, drills, centerless grinder rests, diamond tools and other special production tools.

WILLEY'S CARBIDE TOOL CO.
1340 W. Vernor Highway, Detroit, Michigan

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

— CONTRACT TOOLING AND PRODUCTION —

Arizona and California

ARIZONA TOOL & DIE COMPANY
P. O. Box 181, Tucson, Arizona — Dial 3-8842. Jig boring and repetition hole spacing work using Boeckeler OPTICAL FOLLOWER. Specialists in small lot radio chassis work.

Illinois

DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings.

Michigan

DAVIS TOOL AND ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery. Sheet Metal Stampings and Assemblies.

New York

AMERICAN MEASURING INSTRUMENTS CORP.
The AMIC Bldg., 21-25 44th Ave., Long Island, City 1, N. Y. Jigs, fixtures, gages, dies, precision parts.

CONRAD & MOSER
2-23 Borden Ave., Long Island City, N. Y. Machine Tools & Molds, Parts & Machines Aluminum Cast Parts, Aluminum Sheet Formed Housings.

THE PIPE MACHINERY COMPANY
261 Fifth Avenue, N. Y. C., MU .3-0934-5-6 Mfgs. Thread Gages-taps-dies, (large stocks, specials and standards)—established 1912.

Ohio

TINY TOOL COMPANY
7608 Reading Rd., Cincinnati, Ohio. Phone: VAlley 6102. Small tools, dies, jigs, fixtures, special equipment, parts production—catering to Electronics-Radio-Instrument Fields.

CLEVELAND UNIVERSAL JIG COMPANY
13494 St. Clair Ave., Cleveland, O., MUlberry 1-2080
DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

THE DENNING MANUFACTURING CO.
2024 E. 70th St., Cleveland, O., EX. 1-4900. Designers and Builders of High Grade Dies.

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, O., WO 1-4736 Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

H & P DIE STAMPING CO.
13947 Triskett Rd. Cleveland 11, Ohio
PRECISION DIES, JIGS & FIXTURES
Quality Stampings
Bus & Trailer Parts

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, O. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5601 Tillman Avenue, Cleveland, Ohio, WOodbine 1-2440 & 1-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring.

NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 2-1234. Tool Makers—Short Run Production Work.

THE PHOENIX MACHINE CO.
2711 Church Ave., Cleveland, O., CHerry 1-1048. Contract Grinding, Boring and Planing. Lester-Phoenix Die Casting and Plastic Molding Machines.

A. P. SCHRANER & CO.
3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines, Special Machinery, Tools, Dies, Jigs, Fixtures.

SKYLINE TOOL & GAGE COMPANY
4125 Newark Avenue • Cleveland, Ohio
Telephone: ATlantic 1-2019
DESIGNERS and BUILDERS
Jigs, Fixtures, Dies, Special Machines and Parts
Short Run Production

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Classified Advertising

RATES — $2.00 SERVICE CHARGE

PLUS 20c PER WORD — PAYABLE IN ADVANCE

WANTED—Exclusive territorial and representative rights on commission basis on any items of materials, supplies and equipment allied with the Metal Stamping, Forming, or Forging Fields or the Tool and Die Manufacturing Fields. We can offer complete coverage through our Consulting Engineering Service which is in constant touch with all Manufacturers both large and small in the Peoria and Central Illinois territory. Send all inquiries and complete information in care of TOOLING and PRODUCTION, Box 999, 1975 Lee Road, Cleveland 18, Ohio.

SALESMEN WANTED—One of the nation's foremost producers of quality tool and die steels has available immediate openings for experienced tool steel salesmen. Must be agreeable to change of location. Send complete information, including salary required, in first letter. Applications will be held in strict confidence. Address reply to General Sales Department, Latrobe Electric Steel Company, Latrobe, Penna.

PLASTICS MOLDS—by Gordon B. Thayer tells how to estimate, design, build and use plastics molds. There are 22 chapters (272 pages) of plastics tooling and production "know-how." More than 200 illustrations, tables and charts. $3.49 per copy. Address Huebner Publications, 1978 Lee Road, Cleveland 18, Ohio.

FASTER AUTOMATIC DRILLING at NEW LOW COST

X-750

NEW KAM-GRIP DRILL JIG!

Ingenious engineering changes in the NEW manually or automatically operated Kam-Grip Drill Jig result in easier and faster adjustability, as well as greater accuracy where close tolerance drilling is required. Reducing set-up time, cutting costs and increasing production.

WRITE for free catalog of complete line of Kam-Grip Jigs and Milling Fixtures.

MANUFACTURERS ENGINEERING SERVICE, INC.
SECURITY BLDG. • TOLEDO OHIO

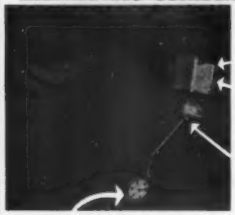
"MITI MITE" No. 100

The New, Amazing Magnetic Base Holder for mounting Test Indicators to flat or curved surfaces INSTANTLY!

Price $7.50 Handsomely wooden boxed.

Posts and adaptors included for taking most small indicators.

ELIMINATES CUMBERSOME HAPHAZARD CLAMPING



Easily mounts to shaft. Magnetic pull app. 50 lbs.

Base size, 1" x 1⅛".

Ball and socket swivel construction permits precision adjustment.

Shows mounting of MITI-MITE on mill arbor to line up milling vise.

See our booth at A.S.T.E. Show, Chicago, in March

ENCO MANUFACTURING COMPANY, Dept. 722
4524 W. Fullerton Ave., CHICAGO 39, ILL.

OTHER "MITI-MITE" UNITS

No. 120—Combination Test Indicator Magnetic Base Holder and 4X double lens Magnifier.....$12.00

No. 150—Duplex Magnetic Base Holder for all dial indicators up to 3" dia.....$15.50

No. 200—Magnetic Base Handi-Lite, complete with 25 and 40 watt bulbs.....$8.50

No. 300—Combination of No. 100 & 200 $13.50

Send for Bulletins 602 and 603

Order from your mill supply dealer or send order with name of your mill supply dealer

Indicator & Light Holder

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

10" or 14"

TWIN WHEEL

WET OR DRY

TOOL GRINDER

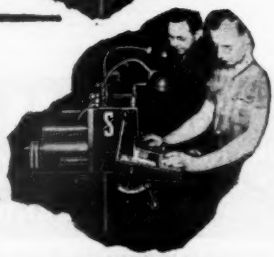
FOR CARBIDE, STELLITE OR HIGH SPEED STEEL TOOLS

one step from rough to finish grind

PATENT PENDING
Type 10 TD

(Right) Mounting a new wheel in 5 minutes!

(Right) Operating view of 10 TD shows ample room to comfortably serve two operators. (Twin lights are optional.) Complete operator comfort when grinding wet. Absolutely no spray or splash.



UNIVERSAL PRECISION PROTRACTOR — TOOL GUIDE® with DRESSER grind any size tool for any desired angle.

WRITE FOR BULLETIN TW

THE STANDARD
ELECTRICAL TOOL CO.
MT. HOPE & SIXTH ST.
CINCINNATI 4, OHIO

ALSO:

GRINDERS — ALL KINDS! UP O 100 H.P. BUFFERS — POLISHERS UP TO 60 H.P.
ABRASIVE BELT MACHINERY. SPECIAL MACHINERY.
TWIN WHEEL TOOL GRINDERS.

Visit Our Booth 1727 at the A.S.T.E. Industrial Exposition, Chicago, Illinois, March 17-21.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

grinder, Carbide Tool

NOW...DUMORE TOOLS

put former hand jobs on profitable, production basis

...with hand grinders

Dumore high speed hand grinders, job-proved for high production output, are *right* for every hand grinding job! Wide choice of sizes, powerful, full-rated motors, and perfect balance make them highly versatile, easily adaptable to every kind of use. From "snagging" castings to such light production applications as the grinding of bullet mold contours (as illustrated) you can depend on Dumores for trouble-free, more profitable service.

Choose from five Dumore precision-built hand grinders (1/30 to 1/4 HP).

...with DUMORE Flex-Shaft tools

Make light work of tough jobs . . . put the power in your hand and the power plant on the bench with a Dumore flexible shaft tool. Get extra control on close tolerance work—reduce work fatigue for steadier production. What's more, it's a real cost cutter on deburring operations.

Furnished with high quality Dumore-built motors (1/30 to 1/4 HP.) and heavy duty shafts. Hand pieces are lightweight for easy grip.

Dumore tools are stocked and featured by leading industrial distributors everywhere. Ask for demonstration.

THE DUMORE COMPANY

1313 Seventeenth Street • Racine, Wisconsin

LAMINA GUIDE PIN BUSHINGS

BRONZE PLATED ON HARDENED STEEL

...now in two style

The bushing that gives you ... long-wearing features of harde... steel yet provides the seize-f... score-free performance of soft bro... is now available in the two sty... at the left.

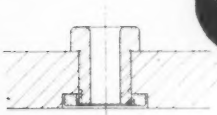
The Lamina Guide Bushing ... hardened steel with free-runn... bronze electroplated on the in... diameter. A ⅛" oil groove furt... lubricates the inside of the bush... in a double figure-eight patte... Ordinary grease is fed to the groo... through a standard Alemite fitti...

In addition to the improved wea... ing qualities of the Guide Bus... ings, Lamina Guide Pins gi... longer service, too. Made of wat... hardening tool steel, these pi... eliminate the brinelling a... "mushrooming" characteristic ... case-hardened pins when drive... into the die shoe.

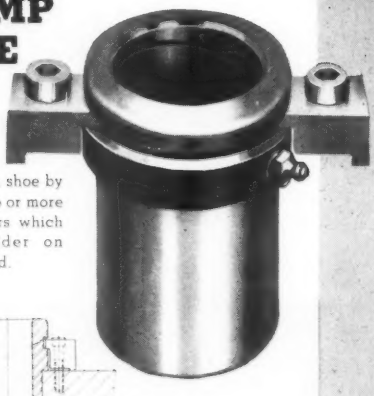
Both styles of these bushings ... stocked in a variety of leng... and diameter for straight, sh... der and removable pins. Lami... **Dies and Tools, Inc., 1492... Eleven Mile Road, Berk... Michigan.**

NUT TYPE

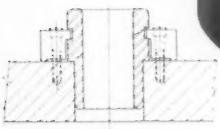
Is secured in shoe by tightening nut on end of bushing. Nut is located in counterbore in shoe for flush assembly.



CLAMP TYPE

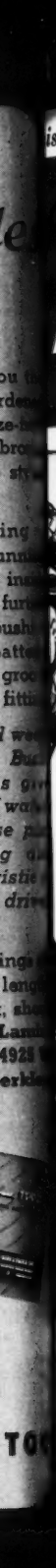


Is secured in shoe by means of two or more clamp fingers which grip shoulder on bushing head.



DISTRIBUTORS: A few desirable territories are open to qualified distributors. If interested, please write for details.

PATENT PENDING

This new brochure fully illustrates Lamina facilities, dies, tools and die making equipment. Send for your copy, there is no obligation.

Lamina DIES AND TO...